

June 25, 2000

Ms. Carol Browner, Director
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, NW
Washington, DC 20460

4R-00-R8

Office of Civil Rights
United States Environmental Protection Agency
Mail Code 1201 A
1200 Pennsylvania Avenue, NW
Washington, DC 20460

Re: **Title VI** of the Civil Rights Act of 1964, U.S.C. 2000d *et seq.*

Complaint: Rocky Mountain Arsenal (RMA) Offpost Diisopropylmethylphosphonate (DIMP) and other contaminant mixture plume at 100 ppb.

Dear Ms. Browner,

I am the complainant - [REDACTED] acting individually, for his family - having been previously exposed to DIMP by virtue of his residence during the 1980's (See: Exhibit A of 1 page), on behalf of REISBECK SUBDIVISION, LLC as its current Manager for 38 acres in direct pathway to the steadily increasing concentrations of DIMP contaminated groundwater, on behalf of the Site Specific Advisory Board to USEPA Region 8 for RMA in representation of the offpost receptor community (Regulator Policy); and as the Community Co-Chairperson (1996-1998) to the U.S. Army RMA Restoration Advisory Board - also in representation of the offpost receptor community (Army Policy).

The impacted receptor community is described in attached Exhibit B of 4 pages - "Environmental Justice Region VIII, Adams County Area, CO. May 18, 2000". The **contamination affected population-receptor area is 29.64 % Minority** within reference area: Adams County (a 24.57 % Minority Population ranking in the top 20% of all US counties in terms of an average individual's added cancer risk from hazardous air pollutants- more than 100 times the goal set by the Clean Air Act, and the most densely industrialized area within the State of Colorado - a Minority Population of 19.11%). The **contamination affected population-receptor area measures 14.88% in poverty / \$9,980.00 per capita 1989 income compared to Adams County of 10.33% poverty / \$12,614 per capita 1989 income and Colorado's 11.40% poverty rate / \$14,812.00 per capita 1989 income.** The area is background stressor impacted with 6 TRI sites, 26 RCRA sites, 2 CERCLA sites, and 2 NPL sites- already demonstrating a pattern of discrimination, and adverse disparate cumulative impacts within this geographic area.

One point source NPL site alone, *The Rocky Mountain Arsenal- U.S. Army*, has released extensive groundwater contamination with food ingestion, inhalation and dermal exposure completed pathways (See: Exhibit C of 2 pages - "Table 6.1: Offpost Operable Unit Groundwater Chemicals of Concern" and "Figure 6.1 Offpost Study Area Exposure

received
7/3/00

Assessment Zones"). The "stressor" mixture concentrations of the "Chemicals of Concern" for pathway receptor Zone 2 approximate .001 ug/l; for receptor Zone 3 @ .001 ug/l; for receptor Zone 4 @ .002 ug/l; for receptor Zone 5 @ .0004 ug/l; for receptor Zone 6 @ .0004 ug/l and receptor Zone 1 @ .0005 ug/l (Note: See attached RAB report dated June 25, 2000 @ 18 pages).

During year-end 1998, the State of Colorado permitted (?) a new groundwater contamination point source exposure pathway, in excess of the pathways discussed earlier. The "Rocky Mountain Arsenal On-Post Hazardous Waste Landfill" will allow an additional 9 million gallons of contaminated mixture to be annually discharged into the already excessively impacted groundwater through the First Creek pathway (See: Exhibit D of 3 pages).

The U.S. Army is responsible for the problem (*Shell Oil Company* is also a potentially responsible party to the cleanup) and for the subsequent remediation program(s) subject to State of Colorado regulations. The respondent, State of Colorado (Recipient), receives federal funding.

Statute of Limitations

The impact of vegetable uptake exposure pathway, as calculated by the State of Colorado, was first presented at a community hearing (the first public presentation of the material at the Citizens Advisory Board meeting) of April 18, 2000. I do not know if the State has yet completely permitted the Landfill Treatment System.

Additional Impacting Factors in relation to the "Remedies" request:

My Complaint seeks to **compel the State of Colorado, which is performing the discriminatory act of failing to enforce the groundwater State standard of RfD 8ppb of DIMP in lieu of "permitting" (implied "authorization") the continued 100ppb DIMP plumes (which have previously migrated past all existing treatment facilities {a.k.a. "First Creek Pathway"}) from continued migration into the offpost community without treatment other than dilution.**

There are no commercial applications nor human potency factor studies for DIMP. DIMP is a precursor for the creation of Sarin nerve gas (GB) and regulated pursuant to the *Chemical Weapons Treaty* (See: Exhibit E of 1 page). DIMP is also a byproduct in the neutralization process of Sarin and VX.

DIMP, "which belongs to a group of compounds known as organophosphates" is highly interactive with other chemical compounds (See: Exhibit F of 3 pages). EPA Region VIII attempts to refute the Army's analysis of its own chemical precursor agent (See: Exhibit G of 1 page) by denying it is a "organophosphate" (Note: EPA risk assessment announced October 28, 1999 concerning nationwide pervasive exposure of Americans - 8:10 adults and 9:10 children had measurable chlorpyrifos in urine).

In November 1996, the Newsday Inc. organization published University of Washington chemist Clement Furlong's gene studies which show **16% of Hispanics and 25% of Asians make a form of paraoxonase (PON1 – the chemical that breaks down or destroys the super-lethal component of organophosphates called “paraoxon”) that doesn't work against sarin (organophosphates) – a genetic trait type R.**

See:

- <http://www.connect4free.net/home/geofjoan/op/index.html>
- then click : #3 “Genes control reaction to Sarin”

Hispanics and Asians live within the impacted community on both a full residency and seasonal basis. **The genetic PON1 impact on Caucasians is only 10% - a significant disparity! This is “environmental racism” to release the organophosphorus compound DIMP into a minority culture's irrigation/surface water impacting those who ‘live’ out of their respective irrigated gardens!**

On April 11, 2000, the State of Colorado confirmed that a child (sensitive sub-population), eating only 20% of the government's daily recommended intake of fruits and vegetables, from a garden irrigated with 100 ppb DIMP, will result in a Hazard Quotient (Reasonable Maximum Exposure) of 1.2 where 1.0 “may be of concern for potential adverse health effects.” (See: Exhibit H of 1 page).

In addition to the adverse impact 1.2 HQ, the State regulator failed to analyze for interactive contaminant combinations (80 compounds identified offpost RMA in the air, soil and water by the Agency for Toxic Substances and Disease Registry {ATSDR})

(See:) <http://www.safe2use.com/ca-ipm/00-04-20a.htm>

nor were concurrent organophosphate interactions for ingestion (DIMP belongs to the group of compounds known as organophosphates) as required by the FOOD QUALITY PROTECTION ACT of 1996 (FQPA) ever analyzed. The cumulative impact of dermal absorption and vapor inhalation was never analyzed.

An extensive separate plume of chloroform, created and released by Shell Oil Company, is migrating on a potential interception vector with the 100-ppb DIMP plume. Under laboratory conditions, **chloroform and DIMP have been shown to reform back into Sarin nerve agent (GB)** (See: Exhibit I of 2 pages).

Although the **Offpost Record-of-Decision provides for the replacement of DIMP contaminated domestic wells, the Army through its contractor- the South Adams Water and Sanitation District- is refusing to replace the complainant's domestic wells, used for irrigation, which measure in regular excess of the State's RfD 8-ppb DIMP groundwater standard.**

Commerce City is permitting 10,000 + homes to be built above the 8-ppb DIMP/ "33 Chemicals of Concern (COC)" contaminant plume without full disclosure to the inhabitants. The 100-ppb DIMP/"COC" plume will bisect many of these planned developments.

Discriminatory Impact

The impact affects all those within the jurisdictional plume areas identified on the "1994 Chloroform and DIMP Concentrations", "Table 6.1: Offpost Operable Unit Groundwater Chemicals of Concern" and "Figure 6.1: Offpost Study Area Exposure Assessment Zones" map attachment(s) when compared to the non-affected population. However, additional **adverse impacts disproportionately affect persons of genetic physiology/race/national origin** not only in relation to the general public but also in relation to the impacted receptor population. The 100ppb DIMP plume is EPA modeled not to attenuate at least through the year 2005 (See: Exhibit J of 1 page). DIMP has a half-life potency lasting hundreds of years.

REMEDIES:

- Enforcement of the State's RfD 8-ppb DIMP groundwater standard coupled with a carbon filtration, pump-and-treat system installed at the leading point of the 100 ppb DIMP plume;
- U.S. Army replacement of my (3) contaminated domestic wells as provided within the Offpost Record-Of-Decision;
- Medical monitoring of all residents who want to be monitored comparable to the Gulf War Veterans program;
- Full and continual disclosure of the DIMP/vegetable health study, as conducted by the State, to all existing and new-coming residents;
- An extensive groundwater monitoring program, which depicts and characterizes in detail, the pathway of the DIMP/chloroform and other contaminants within the groundwater plume (not merely monitoring that measures the rate of dilution).
- Review of the Risk Assessment upon which the Landfill Permit was/will be issued;
- Suspension of the State of Colorado permitting authority and suspension of previously granted permits until a Title VI analysis can be completed.

Submitted by:

[REDACTED]
[REDACTED]
[REDACTED]

CC:

Mr. Bob Martin
USEPA National Ombudsperson
401 M Street SW
Washington, DC 20460-5101

Colorado Senator Wayne Allard
United States Senate
Hart Senate Office Building, Suite 513
Washington, DC 20510-0606

Nicholas Targ, Counsel to Barry Hill
Office of Enforcement and Compliance Assurance
Office of Environmental Justice
USEPA
1200 Pennsylvania Ave. NW (2201A)
Washington, DC 20460

Val Vigil
Colorado State Representative
State Capitol
Denver, CO 80203

Center for Public Environmental Oversight
SFSU Downtown Center
425 Market Street, 2nd Floor
San Francisco, CA 94105

Center on Race, Poverty and the Environment
Attn: Luke Cole
631 Howard Street, Suite 330
San Francisco, CA 94105



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION VII

999 18th STREET - SUITE 500
DENVER, COLORADO 80202-2405

4R-00-R8

NOV 20 1990

Ref: 8HWM-FF

EXHIBIT

A.1

[REDACTED]

Re: Rocky Mountain Arsenal
(RMA), DIMP detection
in a Private Well.

Dear [REDACTED]:

This is in response to your letter concerning 1985 water quality test results and data from a well at 9982 East 112th, Henderson.

You related the 1985 data (425 ppb) to my recent statement regarding 143 ppb as a highest level. What may have been unclear was that my statement dealt with the specific sampling done this summer by the Colorado Department of Health. It was not a blanket statement regarding the highest levels of DIMP offpost. Higher DIMP levels exist offpost, but, to our knowledge, not currently in any private well.

After an exhaustive search we have confirmed the 1985 test result you mentioned (425 ppb). However, we have not been able to identify any further data on your specific well. Tri-County Health Department has scheduled your well to be sampled in the last quarter of 1990.

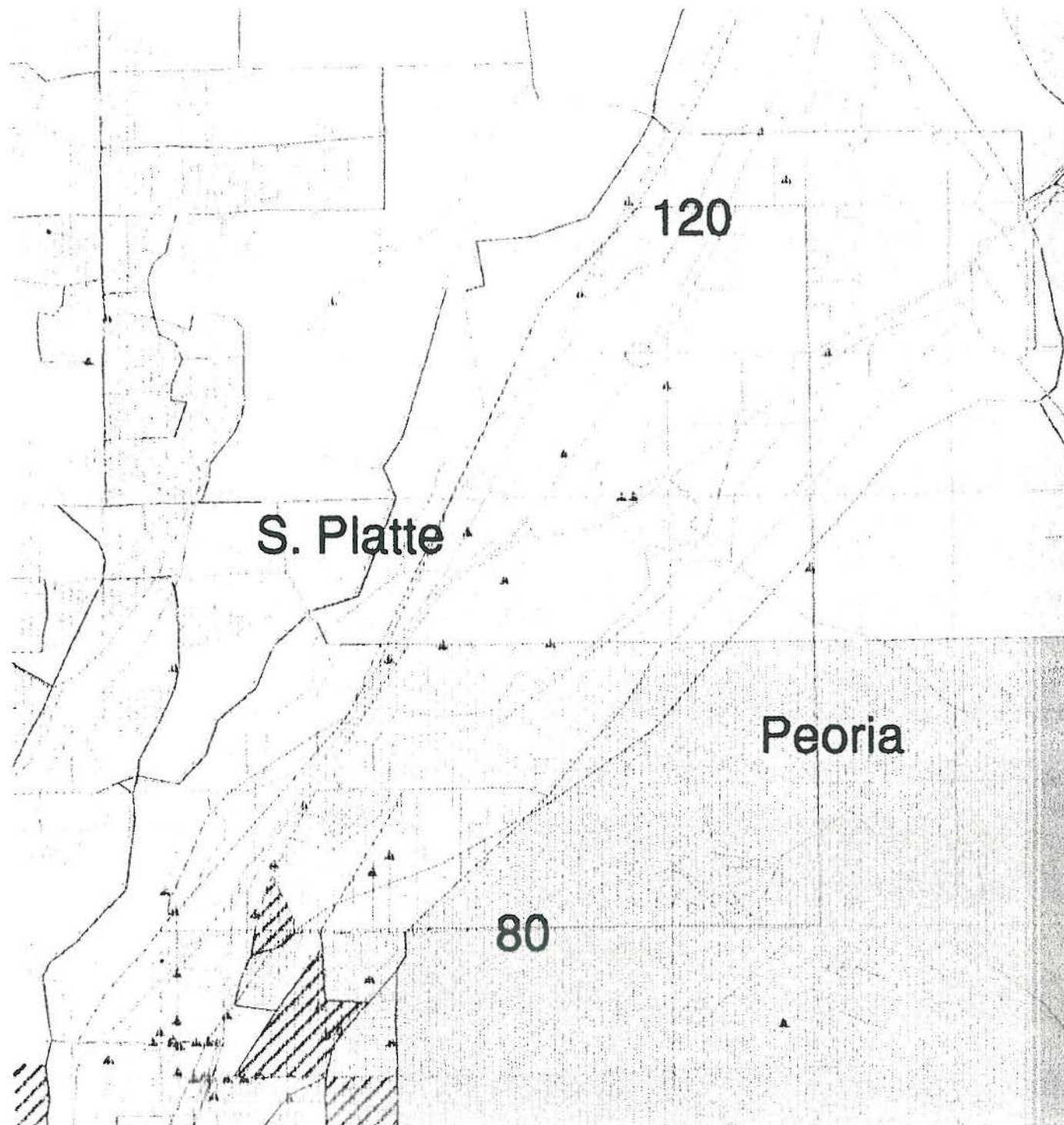
Please call Elaine Heise at 294-1140 or me at 293-1528 any time you wish further information on the RMA contamination.

Sincerely,

Connally E. Mears

Connally E. Mears
EPA Coordinator for RMA
Cleanup

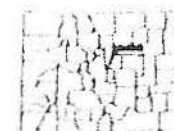
**Environmental Justice
Region VIII
Adams County Area, CO
May 18, 2000**



- Inner Area
- Water
- R8 Streams
- Streets
- NPDES Discharges (1993)
- TRI Sites
- RCRA Sites
- Active CERCLA Sites
- CO Counties
- Below Poverty (%) - Census Block Groups
- 0 - 19 %
- > 20%
- Minority (%) - Census Block Groups
- 10 - 24%
- 25 - 49%
- > 50%
- NPL Sites

0.3 0 0.3 0.6 Miles

Colorado



Produced by EPA Region 8 Office of Enforcement Compliance and Environmental Justice

EPA assumes no responsibility for misuse of this information.

Number of NPDES Discharges (1993) Sites: 0

Demographics information:

	Polygon	Adams	Colorado
Total population	2441	263601	3282245
Minority Population	724	64774	627336
% Minority	29.64	24.57	19.11
Population in Poverty	363	27227	374042
% in Poverty	14.88	10.33	11.40
Per Capita income in 1989	9980	12614	14812
Below Poverty: < 5 years	135	18448	203327
Below Poverty: 5 years	40	3760	41362
Below Poverty: 6-11 years	210	22294	247406
Below Poverty: 12-17 years	165	19835	223811
Below Poverty: 18-24 years	143	21208	223449
Below Poverty: 25-34 years	389	46266	542018
Below Poverty: 35-44 years	318	39782	524981
Below Poverty: 45-54 years	197	24935	317139
Below Poverty: 55-59 years	154	10546	118704
Below Poverty: 60-64 years	51	8520	109612
Below Poverty: 65-74 years	182	11783	174691
Below Poverty: > 74 years	76	5425	100218

Produced by: EPA Region 8 Office of Enforcement, Compliance, and Environmental Justice Program.

Disclaimer:

This report presents demographic and facility data without interpretation.

Data are from the U.S. Census Bureau and the national EPA ENVIROFACTS database.

All data are aggregated at the census block group level.

This information should be used on a qualitative basis only.

EPA claims no responsibility for misuse of this information.

Environmental Justice Report
May 18, 2000

EXHIBIT B-3

Requested By: [REDACTED]
Created By: Nancy Reish and Desiree Mondragon

Purpose: Requested map for 120th Ave to North and 80th Ave to South

Site: Adams County Area

Number of TRI Sites Sites: 6

Id Facility_n

80601SSHCN10300 SASHCO INC.
80640GRNTD10601 GUARANTEED PRODS. OF COLORADO
80640DNVRR8200E DENVER ARCHITECTURAL PRECAST INC.
80640PRNML9200E PURINA MILLS INC.
80640DLTRC9155B DELTA ROCKY MOUNTAIN PETROLEUM CO.
80030BRKCR6815G BIRKO CORP.

Number of RCRA Sites Sites: 26

Id Facility_n

COD032089591 ALBERT FREI & SONS SAND & GRAVEL
COR000002600 ENSCO FIELD SERVICES
CO0000003194 GRA-GAR INC
COD983790056 PPCO HENDERSON SOIL EXCAVATION
COD980806939 GUARANTEED PRODUCTS OF COLORADO
COD084031459 WESTERN TRUCK PARTS INC
COD047163647 HOLSTINE TRUCKING
COD009024522 MERRITT EQUIPMENT CO.
COD980667356 DOWELL SCHLUMBERGER INC.
COR000001792 GROENDYKE TRANSPORT INC
COD079962551 STEERE TANK LINES HENDERSON
COD983800939 RMA PEORIA STREET TREATMENT PLANT
COD095755526 ALLIED SYSTEM
COD980591184 OIL & SOLVENT PROCESS COMPANY (OSCO)
COD047801972 GARDNER-DENVER/COOPER INDUSTRIES
COD980953996 PUBLIC SERVICE CO OF COLO (MAT DIST CNT)
COD064049133 DENVER ARCHITECTURAL PRECAST
COD981550916 PUBLIC SERVICE CO OF COLORADO
CO0000369595 POWERSHIFT INC
COD982599375 GRAGAR INC
COD983801762 LEGACY TRUCKING INC
COD144529914 K & K SURPLUS
COD983801754 COLOGRAPHIC INC.
COD983774670 AMOCO OIL COMPANY
COD080388192 WYCO PIPELINE COMPANY
COD000716522 AMOCO PIPELINE COMPANY

Number of NPL Sites Sites: 2

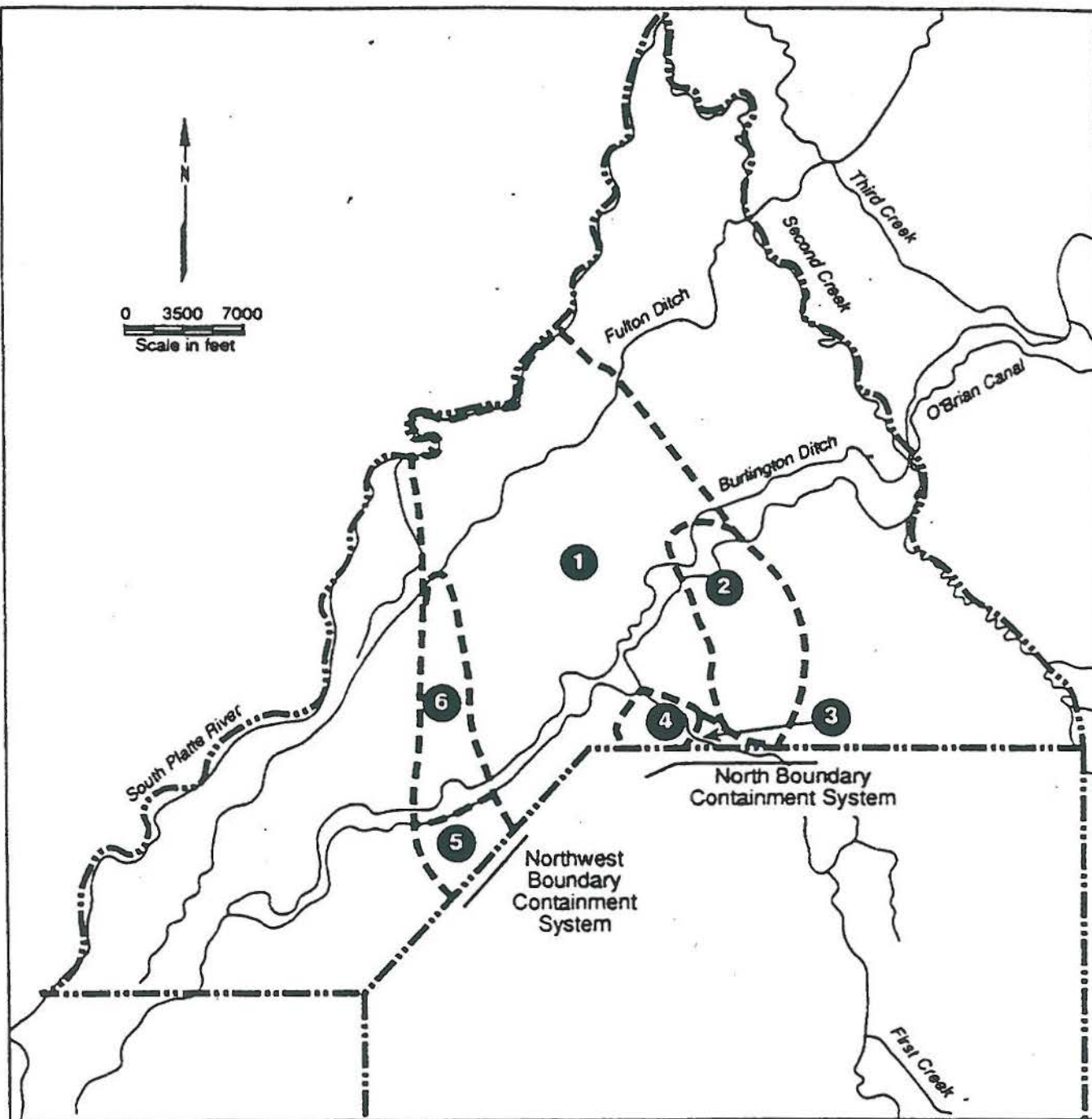
Epa-id Site

CO5210020769 ROCKY MOUNTAIN ARSENAL
COD007431620 CHEMICAL SALES CO

Number of Active CERCLA Sites Sites: 2

Id Facility_n

0801386 COMMERCIAL CARRIERS



Explanation

- Zone 1 Rural residential land use
- Zone 2 Rural residential land use
- Zone 3 Urban residential land use
- Zone 4 Urban residential land use
- Zone 5 Commercial and industrial land use
- Zone 6 Rural residential land use
- Offpost study area boundary

EXHIBIT

C-2

Figure 6.1

Offpost Study Area Exposure Assessment Zones

ABOUT YOUR COMMUNITY



Your Zip Code: 80640 Your Community: ADAMS County

Welcome to Scorecard!

If you'd like to personalize Scorecard so that it remembers your community, you may [register here](#).

Air Quality: Health Risks from Hazardous Air Pollutants

EXHIBIT B.4

- In 1990, this county ranked in the top 20% of all counties in the US in terms of an average individual's added cancer risk from hazardous air pollutants
- 261,008 people in ADAMS County face a cancer risk more than 100 times the goal set by the Clean Air Act.
 - 69% of the air cancer risk is from mobile sources
 - 22% of the air cancer risk is from area sources
 - 9.0% of the air cancer risk is from point sources
- What's **Your** Risk?
- Learn [more](#) about hazardous air pollutants

Air Quality: Does Your Community Meet Clean Air Act Standards?

- In 1998, this county ranked in the top 20% of all counties in the state in terms of Pollutant Standards Index
- [How Clean is Your Air?](#)
- Learn [more](#) about criteria air pollutants

Toxic Chemical Releases from Manufacturing Facilities

- In 1996, this county ranked in the top 20% of all counties in the US in terms of total production-related waste
- [Who is Polluting Your Community?](#)
- [What are the Major Pollutants?](#)
- Learn [more](#) about pollution from manufacturing plants

Agricultural Pollution

- In 1992, this county ranked in the top 20% of all counties in the state in terms of hog waste
- [How does your community compare?](#)
- Learn [more](#) about animal waste from factory farms

Setting Environmental Priorities

http://www.scorecard.org/community/index.tcl?zip_code=80640

4/21/99

Table 6.1: Offpost Operable Unit Groundwater Chemicals of Concern

Chemicals of Concern	Exposure Point Concentration ($\mu\text{g/l}$) ^a					
	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6
Aldrin	0.029*	0.045*	0.050*	0.12*	0.039*	0.030*
Arsenic	2.15	1.63	-	2.78*	2.68*	---
Atrazine	2.87	5.31*	12.9*	7.36*	---	4.48*
Benzene	0.61	0.64	0.75	0.93	---	---
Carbon tetrachloride	---	0.76*	---	---	---	---
Chlordane	---	0.18*	0.19*	0.54*	---	---
Chloride	120,000	205,000	487,000*	660,000*	262,000*	191,000
Chlorobenzene	1.02	1.78	1.77	4.51	1.09	1.27
Chloroform	0.68	67.5*	5.01	1.51	12.0*	3.33
CPMSO	---	14.5	10.4	7.68	---	---
CPMSO ₂	---	4.35	6.63	5.09	---	---
Dibromochloropropane (DBCP)	---	0.44*	0.14	0.15	0.10	---
1,2-Dichloroethane	---	0.77*	0.92*	7.32*	---	---
Dicyclopentadiene (DCPD)	---	3.64	163*	66.6*	---	---
DDE	0.029	0.029	0.22*	0.085	---	---
DDT	0.037	0.033	0.11*	0.10	---	---
Dichlorobenzene	---	5.1	---	2.9	---	---
DIMP	63.3*	713*	590*	4950*	7.68	4.67
Dieldrin	0.034*	0.035*	0.21*	0.055*	0.071*	0.039*
Dithiane	---	---	1.97	4.22	---	---
Endrin	0.033	0.037	0.73*	0.058	---	---
Ethylbenzene	---	---	---	0.57	---	---
Fluoride	1830	2210*	3510*	3290*	1810	2230*
Hexachlorocyclopentadiene	0.029	0.033	0.044	0.043	0.035	---
Isodrin	0.028	0.035	0.047	0.057	---	0.040
Malathion	---	0.26	0.38	0.32	---	---
Manganese	---	1580	---	1250	670	---
Oxathiane	---	---	1.32	2.21	---	---
Sulfate	340,000*	636,000*	909,000*	1,118,000*	148,000	213,000
Tetrachloroethene	0.70	10.1*	20.7*	6.09*	0.75	1.67
Toluene	---	---	1.28	1.18	---	---
Trichloroethene	---	0.64	0.51	2.70	---	4.04
Xylene	0.75	---	---	1.11	---	---

---	Not a chemical of concern in this zone
CPMSO	4-chlorophenylmethyl sulfoxide
CPMSO ₂	4-chlorophenylmethyl sulfone
DDE	2,2-bis(p-chlorophenyl)-1,1-dichloroethene
DDT	2,2-bis(p-chlorophenyl)-1,1,1-trichloroethane
DIMP	Diisopropylmethyl phosphonate
$\mu\text{g/l}$	Micrograms per liter

* Exceeds groundwater containment system remediation goal listed in Tables 7.1, 7.2, and 7.3.

^a All exposure point concentrations represent the upper 95 percent confidence limit on the arithmetic mean of measured concentrations in monitoring and private wells.

Table I. Final Effluent Limitations
Landfill Wastewater Treatment System
Rocky Mountain Arsenal

EXHIBIT

D-2

Constituent	Constituent ID	Standards			PQL
		30 Day Avg. (Chronic)	Daily Max. (Acute)	Remarks/ Basis	
General Parameters (mg/l)					
Alkalinity	ALK	Report	Report		
Ammonia nitrogen	NH3N	Report	Report		
Biochemical Oxygen Demand	BOD	30	45*	CO Eff Limitations	
Chloride	CL	Report	Report		
Cyanide WAD	CYN	Report	0.005	WQS	
Fecal Coliform	COLI	2,000/100ml	Report	WQS	
Flow (MGD)		Report	Report		
Fluoride	F	Report	Report		
Hardness, Total (as CaCO ₃)	HARD	Report	Report		
Nitrate (as N)	NO3	Report	Report		
Nitrite (as N)	NO2	0.5	Report	WQS	
Oil and Grease	OILGR	Report	10**	CO Eff Limitations	
pH, s.u. (min. to max.)	PH-L		6.5 to 9.0	BS	
Phosphate (or total phosphorus)	TPO4	Report	Report		
Sulfate, Total (SO4)	SO4	Report	Report		
Total Dissolved Solids	TDS	Report	Report		
Total Organic Carbon	TOC	Report	Report		
Total Suspended Solids	TSS	30	45*	CO Eff Limitations	
Whole Effluent Toxicity, Acute			LC50> 100%	Quarterly	
Metals (ug/l)					
Antimony	SB	Report	Report		
Arsenic	AS	100	360	WQS/BS	
Cadmium	CD	4.3	68	WQS	
Chromium Total	CR	50	Report	BPJ	
Copper	CU	51	88	WQS	
Iron - Dissolved		Report	Report		
Iron - Total Recoverable	FE	1000	Report	WQS	
Lead	PB	40	1,500	WQS	
Manganese - Potentially Dissolved		Report	Report		
Manganese - Total Recoverable	MN	1000	Report	WQS	
Mercury - Total	HG	0.01	Report	WQS	0.2
Nickel	NI	349	3,380	WQS	
Selenium	SE	17	135	WQS	
Silver	AG	6	38	WQS	
Zinc	ZN	449	500	WQS	
Organic Compounds (ug/l)					
Acenaphthene	ANAPNE	520	1,700	BS	
Acenaphthylene	ANAPYL	0.0028	Report	water+fish	10
Acetone	ACET	100	Report	BPJ	
Aldrin	ALDRN	0.00013	1.5	water+fish/BS	0.1
Atrazine	ATZ	3	Report	CBSG	4
Benzene	C6H6	1	Report	water+fish	
Benzo(a)anthracene	BAANTR	0.0044	Report	water+fish	10
Benzo(a)pyrene	BAPYR	0.0044	Report	water+fish	10
Benzo(k)fluoranthene	BKFANT	0.0044	Report	water+fish	10
Benzo(b)fluoranthene 3,4	BBFANT	0.0044	Report	water+fish	10
Benzothiazole	BTZ		Report		5
Bicyclo[2,2,1]hepta-2,5-diene	BCHPD		Report		10
Bis (2-Chloroethyl) Ether	B2CLEE	0.03	Report	water+fish	10
Carbon Tetrachloride	CCL4	0.25	Report	water+fish	1
Chlordane	CLDAN	0.00058	1.2	water+fish	1
Chlorobenzene	CLC6H5	100	Report	water+fish	
Chloroform	CHCL3	Report	Report	BS/BPJ	
Chrysene	CHRY	0.0044	Report	water+fish	10
DDD	PPDDO	0.00083	0.6	water+fish/BS	0.1
DDE	PPDDE	0.00059	Report	water+fish	0.1

EXHIBIT D-2

9. In many cases, the results of the analysis are not statistically significant.

Table I. Final Effluent Limitations
Landfill Wastewater Treatment System
Rocky Mountain Arsenal

EXHIBIT

D. 3

Constituent	Constituent ID	Standards			PQL
		30 Day Avg. (Chronic)	Daily Max. (Acute)	Remarks/ Basis	
Vapona	DDVP		Report		1
Vinyl Chloride	C2H3CL	2	Report	water+fish	
Xylenes	XYLEN	1000	Report	BPJ	

Notes:

* 7-day average

** Instantaneous maximum

CO Eff Limitations: Colorado effluent limitations

WQS: Water quality standard

BS: Basic standards for Surface Water - Aquatic Life Based Criteria

BPJ: Best professional judgement

water + fish: Water quality standard based on drinking water quality and its effect on aquatic life.

CBSG: Colorado Basic Standards for Groundwater

PQL: Practical Quantitation Limit

Methodology for Selection of Discharge Limits:

- 1) Use standards for 30 Day Avg. (Chronic) and Daily Max. (Acute) as discharge limits.
- 2) When PQL is greater than the standards for the 30 Day Avg. (Chronic) and Daily Max. (Acute), the facility will be in compliance with the discharge control mechanism if the reported concentration is less than the PQL.
- 3) When there is no 30 Day Avg. (Chronic) standard, the facility will be in compliance with the discharge control mechanism if the reported concentration is less than the PQL.
- 4) If there are no Daily Max. (Acute) standards, Report as required.



ORGANISATION FOR THE PROHIBITION OF CHEMICAL WEAPONS

Office of the Director-General

ODG/0114/98

19 February 1998

EXHIBIT E.2

Dear [REDACTED],

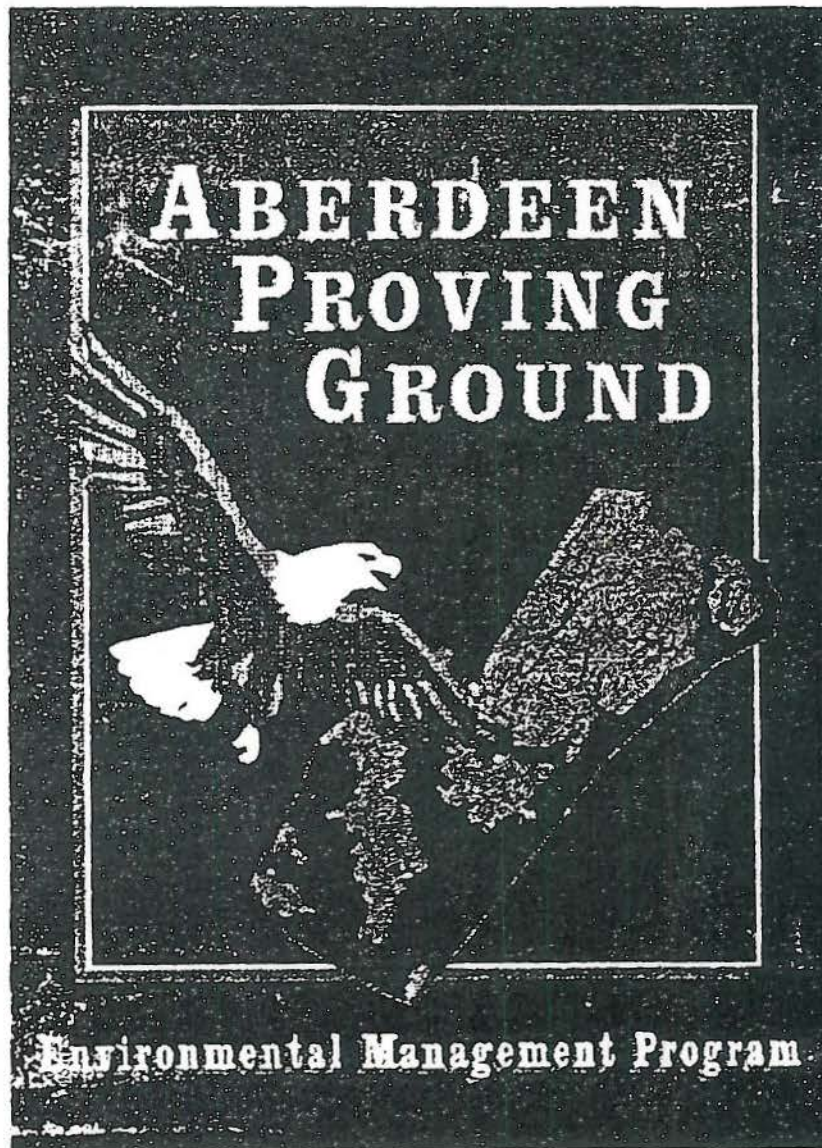
I hereby acknowledge the receipt of your letter dated January 1998 which includes your request for clarification in relation with the potential effects on the environment of a diisopropyl methylphosphonate plume emanated some time ago from Rocky Mountain Arsenal (RMA) facilities.

I appreciate very much the concern of the Restoration Advisory Board to the Rocky Mountain Arsenal on the potential hazards of the cited chemical which has been adequately shown through the information you have provided. As you have pointed out in your letter, diisopropyl methylphosphonate (DIMP) is a Scheduled 2 B chemical and is therefore covered by the provisions of the Chemical Weapons Convention, in particular, those included in Part VII of the Verification Annex.

In respect to this and similar chemicals listed on Schedule 2, States Parties are only required to submit declarations to the Technical Secretariat related to aggregate national data on the quantities produced, processed, consumed, imported and exported as well as to plant sites producing, processing or consuming those chemicals. The purpose of this is of course to prevent the future diversion of these materials for use in the production of chemical weapons. The Technical Secretariat's role is limited to the verification of this particular aspect and I regret, therefore, that your particular request falls outside our mandate.

[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

EDGEWOOD AREA - ABERDEEN PROVING GROUND (APG), MARYLAND
CANAL CREEK STUDY AREA
CHEMISTRY AND ENVIRONMENTAL FATE OF DIISOPROPYL
METHYLPHOSPHONATE (DIMP)



PREPARED BY BATTELLE PACIFIC NORTHWEST
LABORATORY EDGEWOOD OPERATIONS

April 16, 1997

**CHEMISTRY AND ENVIRONMENTAL FATE
OF DIISOPROPYL METHYLPHOSPHONATE (DIMP)**

SUMMARY. Mr. Hirsh, EPA asked Mr. Wrobel a series of questions concerning the source and environmental fate of DIMP. The following is the result of an extensive literature search and talking to subject matter experts with the Chemical Community.

DIMP was used as a precursor in the synthesis of the chemical warfare agent GB (Sarin)¹. DIMP is not a hydrolysis product of GB. The hydrolysis products of GB are isopropyl methylphosphonate (IMPA)² and methylphosphonic acid (MPA).

DIMP was found at two IRP sites: IRP 41, Building E3640, the Process Laboratory; and IRP 7 Building 87, the Pilot Plant. These facilities were used for scale-up of bench syntheses for manufacture of chemical agents and other materials.

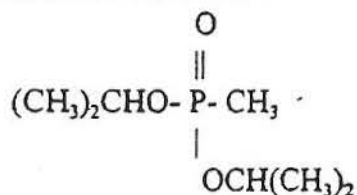
Depending upon environmental conditions and the length of time, the primary products resulting from the complete hydrolysis of DIMP are isopropyl alcohol, MPA, and various amounts of IMPA.

IDENTIFIER: DIMP

CHEMICAL NAME: Diisopropyl methylphosphonate

CAS REGISTRATION NO. 1445-75-6³

MOLECULAR FORMULA: C₇H₁₇O₃P

STRUCTURE DIAGRAM:

SYNONYMS: Phosphonic acid, methyl-, bis(1-methylethyl) ester; Phosphonic acid, methyl-, diisopropyl ester; methane phosphonic acid, diisopropyl ester; diisopropyl methanephosphonate; diisopropyl methylphosphonate; O,O-Diisopropyl methylphosphonate; DIMP.

REFERENCES: More than 200 references exist on file in The American Chemical Society, Chemical Abstracts (1967 to date). References used in the preparation of this paper are cited as endnotes.

DESCRIPTORS: DIMP belongs to a group of compounds known as organophosphates.

CHEMICAL REACTIVITY:

Alkali and Alkaline Earth Metals: An exothermic reaction may occur upon mixing DIMP with alkali and alkaline earth metals.

Azo Compounds: Azo compounds may react with DIMP to produce hazardous conditions.

Caustics: Under alkaline conditions, the hydrolysis of DIMP yields isopropyl alcohol and the metal salt of methylphosphonic acid.

Epoxides: The reaction between DIMP and epoxides may produce hazardous conditions.

Mineral Acids: Excessive strong mineral acids can cause DIMP to decompose and primarily yield alcohol and methylphosphonic acid.¹⁶

Organic Peroxides: There is very little available information on the reaction between DIMP and organic peroxides. However, it is known that GB (Sarin) and other organic phosphorous compounds react readily with hydrogen peroxide and peroxides. These reactions can be used for decontamination and as a means of detecting organic phosphorous compounds. The reaction of hydrogen peroxide runs parallel to the basic hydrolysis.¹⁷

Oxidizing Agents: The exhaustive oxidation of DIMP can yield toxic and corrosive fumes of oxides of phosphorous, sulfur, nitrogen, and heat.

Oxidizing Mineral Acids: Excessive oxidizing acids can decompose DIMP to yield heat and toxic fumes of nitrogen oxides, sulfur oxides and phosphorous oxides.

Reducing Agents: See alkali and alkaline earth metals above.

Water Reactives: The water reactive materials may react with DIMP to produce highly unstable mixtures, heat, and toxic and/or flammable gases.

ENVIRONMENTAL FATE: Organophosphorous compounds such as DIMP are subject to biological and chemical degradation upon entering the natural environment.¹⁸ The ultimate degradation product is orthophosphoric acid (H_3PO_4) or ortho phosphate salts. Chemical Degradation occurs primarily through hydrolysis. The hydrolytic behavior of phosphate diesters such as DIMP is similar to that of the corresponding phosphate triesters¹⁹ while the hydrolytic behavior of the phosphate monoester parallels that of the equivalent phosphate diester.²⁰ Under alkaline conditions, DIMP hydrolyses to produce the monoisopropylester (IMPA) more rapidly than the monoester does to produce the methylphosphonic acid (MPA). DIMP and the monoester hydrolyze at approximately the same rates under acid conditions. IMPA is very stable under neutral conditions. Depending upon environmental conditions and the length of time, the primary products resulting from complete DIMP hydrolysis are isopropyl alcohol, MPA, and varying amounts of IMPA.



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 8
999 18TH STREET - SUITE 500
DENVER, CO 80202-2466

June 6, 2000

Ref: 8EPR-F

EXHIBIT G. 1

[REDACTED]
[REDACTED]
[REDACTED]

RE: Review of "Genes Control Reaction to
Sarin" News Article by Newsday, 1996

Dear [REDACTED]

I am enclosing a memorandum, with attachments, from Dr. Robert Benson which discusses the Environmental Protection Agency's (EPA) review of the news article forwarded by you and cited above. Dr. Benson is a toxicologist for EPA, Region VIII, and one of the national experts regarding the chemical DIMP (diisopropylmethyl phosphonate).

In summary, the article cited presents information regarding different forms of the enzyme serum paraoxonase (PON1) which destroy organophosphates at different rates. The differences in destruction of the organophosphates may result in some individuals being more susceptible to poisoning from some organophosphate insecticides that have significant interaction with the enzyme acetyl cholinesterase.

However, DIMP is not an organophosphate; it is an organophosphonate. DIMP does not significantly interact with acetyl cholinesterase. Therefore, the information regarding the different forms of PON1 has no relevance for the DIMP plume at the Rocky Mountain Arsenal.

I believe that this provides the feedback you requested regarding this study and I appreciate your patience in receiving this information. If you should need any additional information, please call me at 303/312-6660.

Sincerely,

Laura Williams
EPA Coordinator for RMA

Enclosure



Printed on Recycled Paper

Friday, October 29, 1999

Denver Rocky Mountain News

EPA flags risks of pervasive pesticide

Found in pet collars,
on lawns, chlorpyrifos
could be unhealthy
— especially for kids

By H. Josef Hebert

Associated Press

WASHINGTON — A pesticide used on everything from lawns to pet collars is so pervasive that a majority of Americans face potential health risks, a preliminary risk assessment by the government suggested Thursday.

An environmental group pressed for the chemical's removal from the market. But its producer argued that the finding by the Environmental Protection Agency

contained "numerous errors" that exaggerated the risk.

By next summer, the EPA will decide whether to take steps to protect the public or whether to ban the insecticide chlorpyrifos.

The assessment "indicated that risks from the use of chlorpyrifos in residential settings, as well as its risk to applicators, are of concern," an agency statement said.

"This is a preliminary risk assessment," EPA spokesperson Kim Ruby said. "We're putting it out now for expert and public comment and it will go through a rigorous review process."

Chlorpyrifos is one of 40 organophosphate pesticides under scrutiny as the EPA seeks to determine the health risks they

pose, especially to children. The assessment stopped short of saying there is a clear public danger, although it said there is some evidence the chemical could affect the nervous system.

The chemical, produced by Dow Chemical Co., is sold under the trade name Dursban and Lorsban, which are marketed for use in more than 800 products, from pet collars to insecticides, the EPA review said. The chemical also is used indoors as a bug killer.

A study of 993 adults found eight in 10 had "measurable concentrations" of the chemical in their urine. A study of 89 children found nine of every 10 with measurable concentrations, the review said.

EXHIBIT H.2

The State's risk assessment addresses long-term, noncancer health risk to young children and adults. The assessment uses a variety of homegrown produce consumption rates and DIMP ground water concentrations to address a range of population characteristics. An individual's garden produce use habits and DIMP well water concentration can be compared to the results of the assessment to estimate any potential risk.

The estimates are intended to reflect a range of homegrown produce consumption patterns among the general population. The assessment also considers consumption habits reported by residents who have garden irrigation wells in the area of DIMP ground water contamination.

The consumption rates used in this assessment are shown below (as a percentage of an individual's total fruit and vegetable diet). They are called Central Tendency Exposure and Reasonable Maximum Exposure cases.

	Central Tendency	Reasonable Maximum
Fruits	20%	30%
Vegetables	25%	40%

Hazard Quotient

The measurement of risk used in the assessment is the "hazard quotient." A hazard quotient is a number calculated by taking an estimated exposure level and dividing it by a health-protective level. A hazard quotient number of more than 1 indicates a potential health concern.

Based on the highest groundwater DIMP level measured in 1998 (100 ppb) and the two rates of produce consumption, CDPHE calculated the following hazard quotients.

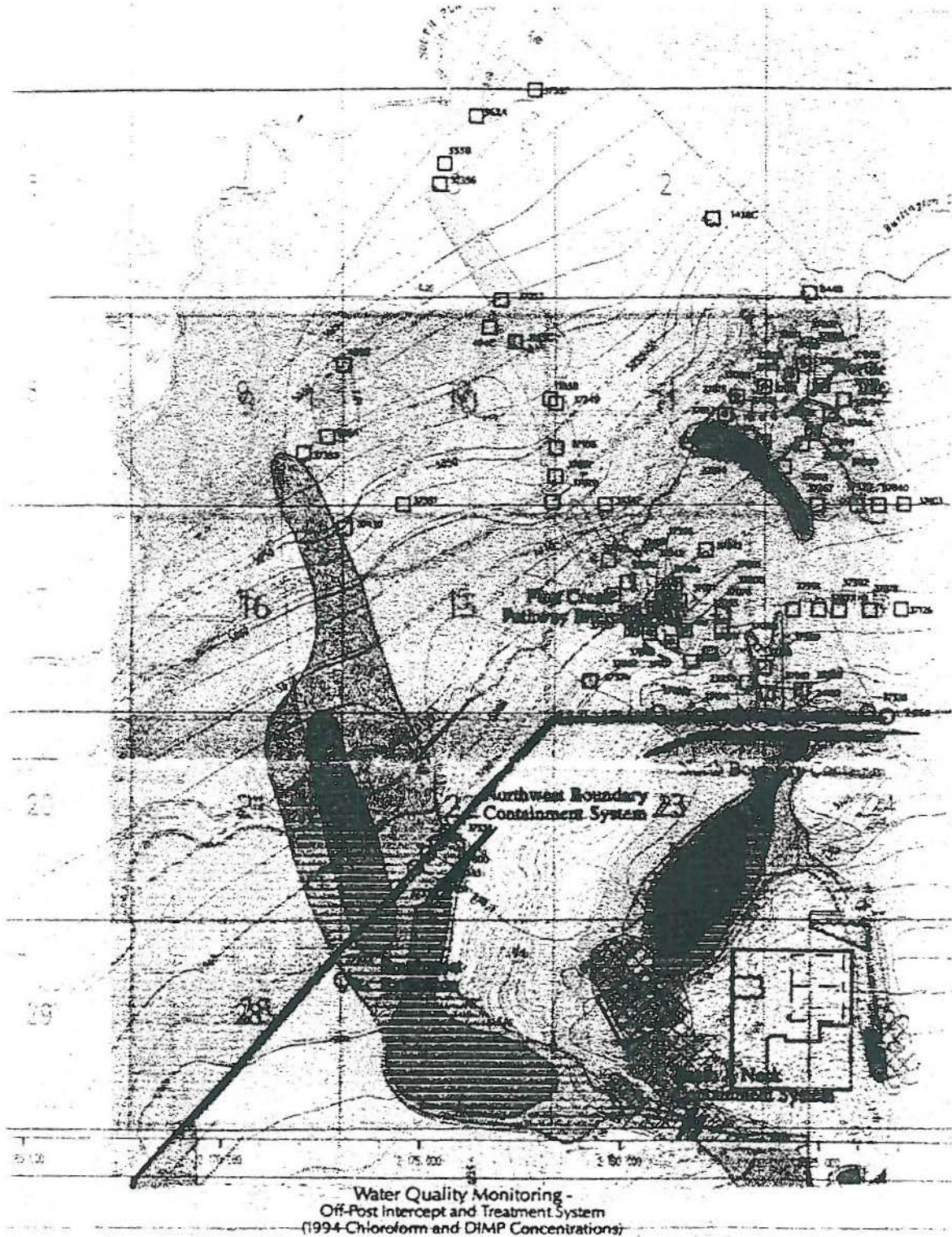
Child and adult hazard quotients for exposure to DIMP-contaminated vegetables irrigated with groundwater at 100 ppb DIMP

Hazard Quotients for 100 ppb DIMP		
	Central Tendency	Reasonable Maximum
Children	0.52	1.20
Adults	0.43	1.00

Conclusions

✓✓ The risk associated with exposure to DIMP at concentrations at or near the State ground water standard of 8 ppb is unlikely to be a public health concern. The risk estimates for the higher consumption rate (Reasonable Maximum Exposure) assumptions and the highest recently measured DIMP well water concentration (100 ppb) are at or slightly above 1.0 and may be of concern for potential adverse health effects. However, the Tri-County Health Department resident survey indicates that home garden use does not occur at the household with 100 ppb DIMP measured in its garden irrigation well. The survey also shows that home gardeners in the RMA offpost area of interest (i.e., those with

EXHIBIT I. 1



Legend

In Minimum Amount

Enhanced Maximum Value

COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT
Hazardous Materials and Waste Management Division

INTEROFFICE COMMUNICATION

TO: Ed LaRock, RMA Geologist
Barbara Nabors, RMA Project Manager

FROM: Ken Niswonger, Senior Chemist, Hazardous Materials and Waste Management
Division

DATE: September 27, 1999

SUBJECT: Response to citizen request for evaluation of reformation potential of nerve agents
in Rocky Mountain Arsenal (RMA) groundwater

A letter dated August 5, 1999, from Mr. [REDACTED] of the Rocky Mountain Arsenal Restoration Advisory Board, requested a formal evaluation of the potential for reformation of the chemical warfare agent sarin ("GB") in off-post RMA groundwater.

Response Summary

- I. GB reformation or regeneration from its hydrolysis degradation products is not possible. GB reformation is not possible under conditions of reduced pH or neutral pH, in water solutions or in chloroform extracts.
- II. GB synthesis, or formation, from diisopropyl methyl phosphonate (DIMP) a byproduct of GB production, is possible under appropriate conditions. These conditions are acidic pH with concentrated fluoride ion and concentrated chloroform in a separable, nonaqueous (non-water) organic phase. These appropriate conditions are not found in off-post groundwater nor in garden vegetables irrigated with this water.

I will discuss these conclusions in detail below.

I. Reformation Information Request

[REDACTED] August 5 letter suggested that GB hydrolysis products may reform by way of a "phosphonate anion diester" which he described using the chemical shorthand, $\text{MeP}(\text{O})(\text{OPr})_2$.

[REDACTED] August 5 letter also questioned the possibility that VX may reform from its degradation products, in particular **diisopropyl 2-aminoethanethiol cation** and **methylphosphonate anion** (emphasis added by [REDACTED])

Rocky Mountain Arsenal Outpost DIMP Distribution in 2005

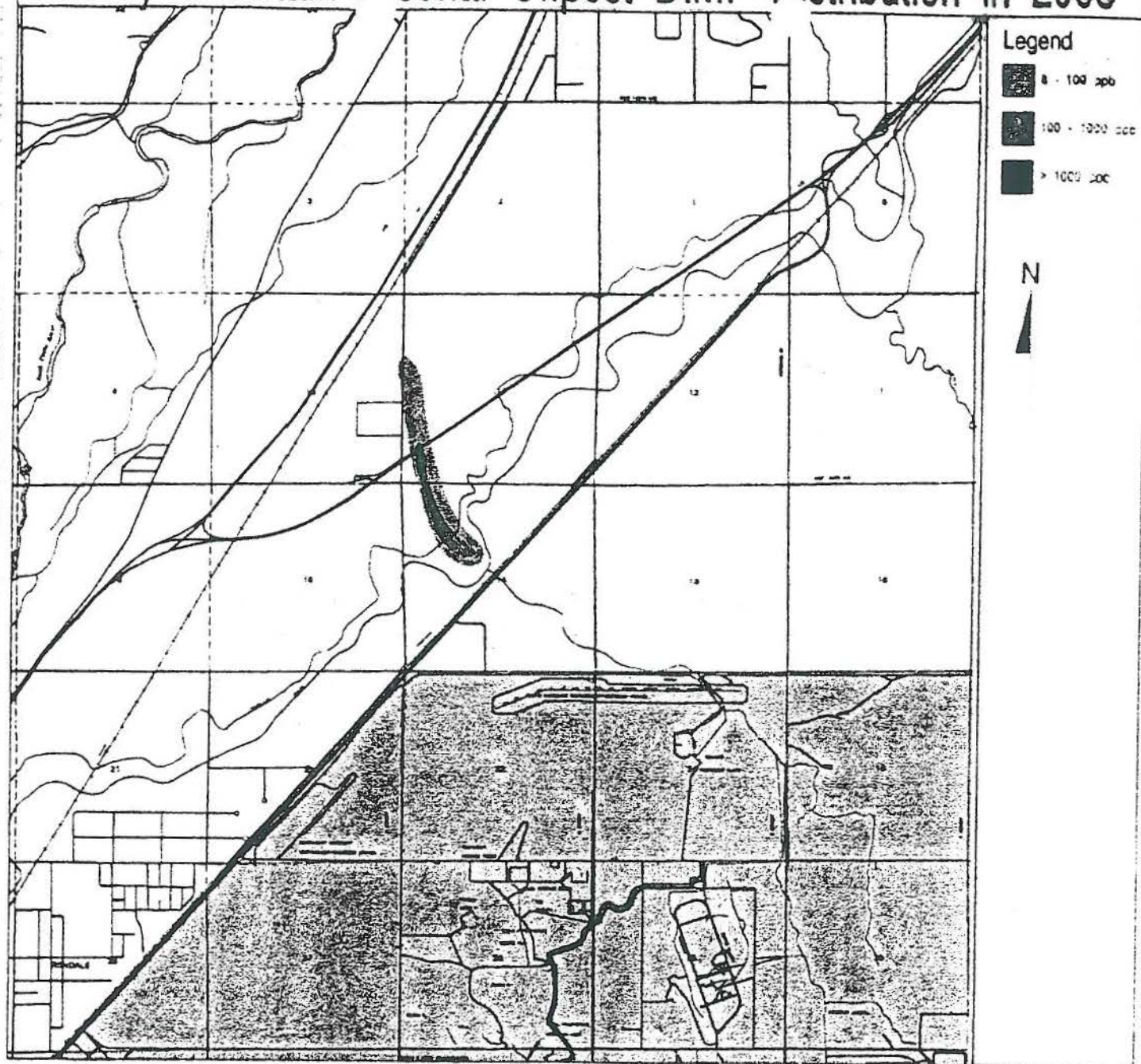


EXHIBIT J.1



By [REDACTED] ©
Community Co-Chairperson 1996-1998
{ Fifteen Pgs. (Amended) Text / Three Exhibits }

666(1986) ↔ 750+ RMA * Combined Chemical Compounds

June 25, 2000

Vs.

"coc" = Chemical of Concern (38 COC's changed unilaterally to 27 by EPA/Connelly Mears [46])

() = Off-Post System Effluent

! = Possible Carcinogen

3 = SARA III Disclosure required

■ = ISSUES of concern

Bold = Potential Synergistic Combinations

* RMA = Rocky Mountain Arsenal
Adams County, Colorado

Diisopropyl methylphosphonate DIMP [48],[49],[50],[60]

- Chemical Abstract No.1445-75-6;
- The depth to groundwater on the RMA ranges from 1 to 60 feet;
- An estimated 100-200 tons of methylphosphonic acid and calcium/sodium salts were discharged to the waste basins prior to 1955. At that time, no method existed for determining these species or diisopropyl methylphosphonate as separate entities, and the cited figure may include all three as organic phosphorous compounds [70];
- There is direct drainage to South Platte River pathway [6] at a flow rate of between 5 ½ to 22-½ feet/day. 1958/1960 concentration levels entering the South Platte River at the Henderson entry point were at 30 ug/l. = 30 ppb[11]. The South Platte River, at the Henderson entry point of the DIMP plume, has the greatest number of organochlorine compounds in bed sediment and fish tissue detected in the entire River basin [53]. The chlordane, Endrin, and PCB concentrations (which interacts synergistically with Dioxin) found in the fish tissues would be toxic to predators[53];
- The Henderson entry point is very sensitive to contamination migration into the underlying aquifer. The pathway of the 24,000-acre foot plume[7] of ≈ 7,800,000,000 gallons of contaminated groundwater at .392 ppb comes from the *Rocky Mountain Arsenal* – operated by the U.S. Army. The DIMP plume, a non-naturally occurring and continuous pollutant, extends 10 miles north of RMA. The State Water Quality Control Commission believes that as a matter of policy all potential beneficial uses of water should be protected on a statewide basis from potential contamination from non-naturally occurring organic chemicals. In May 1974, DIMP and dicyclopentadiene (DCPD) were detected in surface water at the northern boundary of the RMA. Army data formally indicated DIMP contamination on the west side of the Platte River (1989), which was confirmed by the State of Colorado in April 1993. However, the Army limited the purported Off-post study area at the South Platte River under this faulty 'hydrologic barrier' assumption. On May 28, 1992, Connelly Mears of EPA Region VIII confirmed that the plume was moving toward Montana as originally reported to the GAO on May 26-27 by RMA Project Manager: Colonel Eugene Bishop;
- A 12,000-foot deep disposal well, located adjacent to Basin F, was used from 1962 to 1966 [38] to dispose of liquid wastes and supplement the evaporative capacity of Basin F. A fault runs beneath the Arsenal. Purportedly, on January 5, 1966, the injected waste contributed to the shifting of underlying earthen plates, along a transform fault, triggering earthquakes measuring a magnitude of 5 to 5.5. The last earthquake along the fault measured 2.5 in 1984

and 4.3 (Richter) in 1981 [71]. More than 1,500 quakes occurred in Denver when the pumping was taking place[78]. A classified office within the National Security Agency confirmed that a specific testing program concerning seismic studies utilized concrete vaults, located on Section #9, through 1982. The injection well was plugged in early 1985.

- The bedrock aquifers affected by RMA-DIMP contamination include the Denver, the Arapaho (300-400 feet deep) and Fox Hills;
- The groundwater contributes approximately 75 percent of the total carcinogenic risk per the Dec. 19, 1995 *Offpost Operable Unit – Final Record of Decision*. Pursuant to the U.S. DEPARTMENT OF THE ARMY RESPONSES TO STATE (Colorado) COMMENTS REGARDING ROCKY MOUNTAIN ARSENAL OFFPOST PROPOSED PLAN- Comment No.4. Selection of the Appropriate Risk Level: "At the Rocky Mountain Arsenal, the Army is assuming that a risk level of 5 in ten thousand (5×10^{-4}), or one in two thousand is acceptable, even though it has made no showing that the NCP's (National Contingency Plan) point of departure {the prevention of excess risk to human health greater than one in a million (1×10^{-6})} could not be achieved [1];
- The Army has known since February 1953 that DIMP is Sarin nerve agent precursor [12] {also see the "Fluoride/Chloride/Sulfate" grouping}. This information was withheld from the community. During 1953 through 1957, changes in the purification processing of GB Sarin occurred and DIMP was retained in the GB agent instead of being discarded [70]. Offsite contamination from the site was first detected in 1954 [5]. Production of DIMP containing nerve gas purportedly occurred during the years of 1953-1958[41] wherefore the RMA became a storage site for unused chemical warfare agents. Prior to 1956, the effluent from the production of Sarin was disposed of in five unlined surface ponds [10]. Between 1955 and 1970, more than 204,000 individual obsolete GB agent filled munitions were demilitarized [53]. Then, beginning in 1972, 1973 and 1976, the GB-manufacturing facility was used to detoxify the stored GB nerve agent [41]. 4,000 tons of Sarin were disposed of at the Arsenal from 1973-1976[59]. DIMP was released at the RMA as a result of both the manufacturing and detoxification activities conducted at the site. Regulators have described DIMP as a purported "by-product" of Sarin manufacturing omitting that DIMP is the by-product of the neutralization process. Dimethylmethylphosphonate (DMMP) is the identified "by-product" of GB manufacture. DMMP is also a by-product from various SHELL manufacturing processes.
- DIMP "T1/2 is approximately 530-687 years[18][19][57], biotransformation is very slow in soil;
- DIMP bioconcentrates in most plants (leaves) up to 20 times [22] (stems up to 9 times) greater than concentrations contained in solutions. DIMP may enter the food chain via animal feed;
- DIMP risk assessments assumed that ingestion is the major route of exposure without quantifying the doses received from other routes such as inhalation of shower steam and skin exposure(s);
- The metabolite of DIMP is isopropylmethyl phosphonic acid (IMPA) which is also a Sarin hydrolysis product [13]. IMPA and methylphosphonic acid (DIMP hydrolysis products [17]) are the compounds which bind to the acetylcholinesterase (AChE) in the blood of all Sarin poisoning victims. The Army uses 700 ppb as a safe level of IMPA in the groundwater {detection limit of 25 ppb} while the State of Colorado proposes 6 ppb. IMPA was not adequately characterized at the RMA [3]. Extreme depression of AChE activity is one of the symptoms of poisoning with organophosphorus agents and is not specific to acute Sarin poisoning;
- DIMP belongs to a group of compounds known as organophosphates [14]. Organophosphates are efficiently absorbed by inhalation, ingestion, and skin penetration [28]. Organophosphate (a.k.a. OP) and the insecticide chlorpyrifos (detectable in the bodies of most members of the U.S. population[26] and extensively present in the South Platte River) has been demonstrated to interact synergistically[24][25][27];
- New research on organophosphate pesticides suggests that chromosome 22q11.2 may be susceptible to genetic disruption and mutation via organophosphate exposure [54].

- The ability to withstand exposure to organophosphates is genetically controlled. In the blood of all human beings is an enzyme called paraoxonase, or PON1. PON1 breaks down or destroys the super-lethal component of organophosphates, a chemical called paraoxon. Some people make a form of PON1 that doesn't work against organophosphates. The trait – called type R – is genetic. People who inherit type R genes from both their parents, rendering them homozygous for the trait, are extremely vulnerable to the toxic effects of organophosphates. People who make normal PON1 – this is regulated by type Q genes – are better able to resist the lethal chemical. If one is heterozygous, having inherited Q from one parent and R from the other, susceptibility to organophosphates is midway between the two extremes. A separate, as yet unidentified gene, regulates how much PON1 is made. Even if a person is homozygous for the beneficial type Q gene, it will do no good if the amount of PON1 is low when organophosphates enter the body. Gene tests show Asians are most likely to carry the susceptible type – R genes. 25% of Asians are homozygous for organophosphate susceptibility. **ABOUT 16% OF HISPANICS ARE HOMOZYGOUS TYPE R.** [72] 12.4 % of a portion of the RMA's offpost study area's 1,405 residents (Census Tract 85.12) are of Asian and Hispanic origin [73]. However an extensive influx of migratory Hispanic workers converge seasonally in the Henderson agricultural area on an annual basis. Researchers haven't yet tested Africans or African Americans. The offpost risk assessment did not evaluate this sensitive population group with respect to DIMP exposure.
- DIMP reacts with alkali and alkaline earth metals, azo compounds, caustics, epoxides, mineral acids, possible organic peroxides, oxidizing agents and water to produce highly unstable mixtures, heat, and toxic and/or flammable gases [16]. Because OP threats are designed to be poisonous, there is probably a narrow margin between safe levels in water and those producing performance-degrading health effects [23].
- Although fluoroacetic acid, the decomposition product of Sarin nerve gas, was identified as a "prevalent contaminant" of the RMA (Army report to Congressional Committee on Armed Services – April 1991), however-thereafter, no chemical specific monitoring was ever undertaken- in fact the acid was removed as a Chemical of Concern [46].
- "Nerve agents reform(ed) at reduced pH or in chloroform extracts of the neutralized or slightly acidic brines... Results obtained confirmed G agent reforming in either the neutral aqueous solution or in the chloroform extract." [48]
- "G agent is present in a chloroform extract of the neutralized aqueous solution of decontaminated G agents. The agent in the chloroform likely results from reformation of G agent either in the chloroform or in the neutralized aqueous solutions. Fluorination reactions are detected by NMR spectroscopy in the neutralized aqueous solution." [49]
- It has been shown that fluoride ion may act as a nucleophile for substitution reactions with organophosphorus esters. [50] (See: Chloroform hereafter).
- SHELL Chemical Company developed the gas chromatography methodology, to analyze DIMP, adopted by the Colorado Department of Health, which involves extraction of DIMP from water with chloroform. A 1ppm solution of DIMP in chloroform was used as a standard [56].
- DIMP is a toxic chemical weapon/ a Scheduled 2.B. chemical per the CONVENTION ON THE PROHIBITION OF THE DEVELOPMENT, PRODUCTION, STOCKPILING AND USE OF CHEMICAL WEAPONS AND ON THEIR DESTRUCTION "Convention" signed by the United States of America on 1/13/93 and ratified on 4/25/97 [33]. The "Convention" specifically prohibits any "dumping in any body of water, land burial or open-pit burning" [44] of the DIMP chemical agent inclusive of waste streams from effluent/waste handling/treatment areas;

- Other “*Convention*” controlled compounds possibly flowing within the DIMP plume include: Arsenic trichloride & Arsenic trioxide, (See: Arsenic below {measured within the DIMP plume at 5.8 ug/l where recommended maximum level is 0.0032 ug/l}), Lewisite (M-1)- {High concentrations in Basin A}, Dimethyl methylphosphate (DMMP), Triethyl phosphite, Sulfur dichloride, and Thionyl chloride {Also again see the: “Fluoride/Chloride/Sulfate” grouping}[18]. #90,000 pounds of the biological agent known as stem rust of wheat (Puccinia graminis) a.k.a. TX agent [40], a plant pathogen, was also deposited into the ground of the northern arsenal proper purportedly (via RMA Commanding Officer: Col. Shear) retaining its chemical viability and never recovered by the Army. TX was not even listed as a chemical of concern when site characterizing the RMA contamination;
- Extensive use of 2,4-D (2,4 Dichlorophenoxyacetic acid) and 2,4,5-T (2,4,5-Trichlorophenoxyacetic acid) herbicides/antiplant compounds were used during each TX production season [40]. The combination of 2,4-D and 2,4,5-T creates “Agent Orange”. The US Air Force has statistically linked “Agent Orange” exposure to Diabetes [74].
- Given that DIMP is a CWC Schedule 2.B. precursor a.k.a. military munitions; and given 40 CFR 266.200 – 266.206 {Subpart M – Military Munitions} effective August 12, 1997(DIMP is DOT classified as a combustible liquid per 49CFR173.115b)[15]: Why is the 8ppb State DIMP groundwater quality standard {with accompanying practical quantitation limit of 1.0ppb} not being enforced throughout the off-post * DIMP plume? {Note: * Meaning - groundwater’s which have migrated beyond the offpost treatment / boundary intercept systems}. The RMA boundaries are used as “*Point of Compliance*”. ***The entire plume of groundwater should be the off-post point of compliance - not merely drinking water*** per the policy of the EPA [47]. The Colorado Water Quality Control Commission believes it is technically and economically feasible and practical to treat water contaminated by DIMP with granular activated carbon to achieve a DIMP concentration in groundwater of 8ppb or less. The boundary containment systems do not prevent all contaminants from migrating off-post[8][9]. The Colorado 8ppb DIMP standard should be adopted as an offpost Applicable or Relevant and Appropriate Requirement under CERCLA for that is the intention of the Colorado Water Quality Control Commission except where a determination is made that such a variation is ‘authorized’ per applicable provisions of federal statutes [§3.11.5(C)(5)(a); §3.1.11(5)]. The ‘regulators’ deny any such authorization – why the enforcement delays for offpost groundwater, which has migrated past the pump-and-treat facilities?
- Although an assumption may be made that the deeper Arapahoe Aquifer is clean, indications exist that contaminants are seeping to degradate the aquifer – yet no State of Colorado enforcement to enforce the ambient quality as of October 31, 1991?
- 50 confined flow-system wells that provide a conduit for Arsenal groundwater flow from the unconfined aquifer to the confined aquifer have been identified [39].
- Using Colorado’s reference dose of 8ppb (established prior to the G Agent reformation documentation was made public) the Hazard Quotient of DIMP for vegetable uptake in an adult, {not combined with other chemical compounds}, **is 1.306529**, **where 1.0 represents a level of concern that potential undesirable health effects may occur; children are a greater risk!**
- On April 11, 2000, the State of Colorado confirmed that a child (sensitive sub-population), eating only 20% of the government’s daily recommended intake of fruits and vegetables, from a garden irrigated with 100 ppb DIMP, will result in a Hazard Quotient (Reasonable Maximum Exposure) of 1.2 where 1.0 “may be of concern for potential adverse health effects”[80].
- 1997 groundwater was estimated to cross the north and northwest boundaries of RMA at approximately 2,400 gallons per minute (1.3 Billion gallons/year)[8]. In 1997, the north, northwest, & offpost filtration systems treated 883,071,191 gallons[9]. Nearly one-third of the annual contaminated groundwater leaves RMA “untreated” before migrating into the community water supply;

- The in-situ remedy of *natural attenuation* must comply with state groundwater cleanup standards [29] of 8ppb[30]. Based upon EPA modeling [32], the DIMP plume, which has migrated past the treatment facilities, will violate State groundwater standards at least into the next decade [32]. Attenuation/Dilution, not treatment or confinement, is the chosen off-post remedy for non-drinking/irrigation water contamination - 99 percent of the 24,000 ac.ft. contaminated plume volume {100 ac.ft. mitigated *drinking* water}. Even during the 1960's, Army disposal methods included 'dilution' only AFTER adequate treatment [31]. This volume has migrated past all treatment facilities resulting in unacceptable impacts to receptors. This remedy of dilution results in significant cross-media transfer of contamination from soil to groundwater, then to surface water via irrigation spray, then to air. Attenuation also affords the creation of "transformational products" from original chemical compounds. I am not aware of any "technical impracticability {TI} determinations which would preclude an intercept-treatment facility down gradient at the Henderson/Platte River entry point. I am not aware of any contingency remedy ever considered in lieu of dilution for the off-post plume;
- South Adams County Water and Sanitation District (SACWSD) and Denver Water jointly have acquired two sites, within the DIMP plume, to be used for water storage. It is currently estimated that the sites will store 8,000 acre-feet of water, providing 5,000 acre-feet of yield to Denver Water. Denver Water would then provide 4,000 acre-feet of this yield to SACWSD, 50 acre-feet to the RMA, and retain 950 acre-feet for use in its municipal system.
- There are three other "background" Superfund sites within 2 miles of RMA: Woodbury, Chemical Sales and Sand Creek. The area is background stressor impacted with 6 TRI sites, 26 RCRA sites, 2 CERCLA sites, and 2 NPL sites- already demonstrating a pattern of discrimination, and adverse disparate cumulative impacts within this geographic area [79].
- The contamination affected population-receptor area is 29.64 % Minority within reference area: Adams County (a 24.57 % Minority Population ranking in the top 20% of all US counties in terms of an average individual's added cancer risk from hazardous air pollutants- more than 100 times the goal set by the Clean Air Act, and the most densely industrialized area within the State of Colorado - a Minority Population of 19.11%). The contamination affected population-receptor area measures 14.88% in poverty / \$9,980.00 per capita 1989 income compared to Adams County of 10.33% poverty / \$12,614 per capita 1989 income and Colorado's 11.40% poverty rate / \$14,812.00 per capita 1989 income [79].
- Per the U.S. GAO (9/28/94), at least 500,000 people were covertly exposed to chemical, biological and nuclear tests from 1940 through 1974. In March 1999, government reports revealed intentional production-worker exposure to beryllium dust 100 times above the safety limit in an effort to maintain beryllium supplies for weapons. A House Commerce Committee panel (September 22, 1999) revealed that managers at the government's *Paducah Gaseous Diffusion Plant*, located in the State of Kentucky (as early as 1952), "knew about the presence of plutonium and other highly radioactive metals in direct exposure to employees in the plant" but decided not to warn workers because of fears of a public outcry [61]. DIMP exposure fits this category of covert exposure of private citizens since the Army has known DIMP to be a Sarin precursor agent since February 1953;
- Col. Christopher Lesniak, national manager of the Chemical Stockpile Disposal Program admitted that on May 8, 2000 - GB (Sarin) was emitted into the environment out of the smokestack of the Army's chemical weapons incinerator in Tooele, Utah. The Army stalled for four hours before notifying the public. Nerve agent monitors in the exhaust stacks alarmed at levels 3.6 – 8.7 times higher than allowed under the Army's permit [77].
- Implementation of the *Natural Attenuation* remedy coupled with "Institutional Controls" is an act of inverse condemnation of otherwise 'clean' water. Water rights are appropriated private property;

- On May 18, 1998, Colorado initiated a "*Gulf War syndrome registry*" for veterans who have become mysteriously ill since fighting in Desert Storm. Exposure to organophosphonates has been identified as one probable exposure compound. DIMP belongs to the group of compounds known as organophosphates [14]. The *syndrome registry* database is to be maintained by the State Health Department. RMA medical monitoring should have access to this database for comparison to DIMP exposure candidates in the Henderson community;
- Only an abbreviated review period concerning the Army's '2nd 1995-1997 mink study' and its incorporation into the ATSDR "TOXICOLOGICAL PROFILE FOR DIMP" (the Profile of which is also inadequate) was afforded to the community.
- **80 compounds have been identified offsite [20]**, within the RMA DIMP plume (although 1989-1991 concentrations of combined chemicals are between 406,249.569 ppb – 1,787,616.29ppb. and exceeded the hazard indice of 1.0 in both chronic and acute residential child non-cancer risks in *Endangerment Assessment* zones 2, 3, and 4 [Zone 4 is four times the acceptable limit] not even the traditional additivity approach to *Risk Assessment* - evaluating these groupings of chemical interactions - has occurred. The individual risks from each compound in a particular exposure pathway is summed to obtain an estimate of the overall carcinogenic risk for all pathways combined}, inclusive but not limited to:

Organochlorine pesticides:

- ❖ *Inhalation, ingestion, and dermal absorption are the pathways of concern for all organochlorine's with long biological half-lives; they biomagnify in the food chain; and persist for a long time in the environment. Repeated low dose exposure may result in weakness, ataxia, tremor, confusion, muscle twitching, and central and peripheral paresthesias...Most of the compounds are strong mutagens, teratogens, reproductive toxicants, and carcinogens in animals; human risks in these areas are highly suspected.* [45]

Aldrin ALDRN coc ! 3

- Effluent to basin A until 1957, Aldrin is long-lived in soil and water. Decomposes to dieldrin in soil (T1/2 4 to 5 years).

(Dieldrin) DLDNRN coc ! 3

- A pattern of moderate bioaccumulation and biomagnification, with increased concentrations at the upper end of the food chain is apparent. T1/2 at 7 years. Concentrations located in the Section 28 pathway at depths greater than 10 feet. Dieldrin plume extends north of RMA;
- One of three most commonly detected contaminants in stream-bottom sediment off-post even though the Army's certified reporting limit was 0.05 ug/l (State of Colorado at 0.002 ug/l);
- The majority of the South plants area is contaminated with dieldrin.

(Endrin) ENDRN coc 3

- T1/2 at 4 to 8 years – the byproduct in an aerobic environment of Isodrin. – was listed in the 1970's Army inventory as "Rid-a-Bird".

(Chlordane) CLDAN coc ! 3

- Bioaccumulates; the pesticides dieldrin, endosulfan, toxaphene, and chlorodane, when combined, were shown to exert estrogenic effects in cultured yeast cells that were 160 to 1,600 times higher than any one acting alone [21]. This synthetic pesticide is made up of 147 different components, has a half-life of 22 years in soil, is insoluble in water, and was banned by the USEPA in 1988.[76]

2,2-Bis(p-chlorophenyl)-

1,1 dichloroethene PP DDE ! 3

- Found in section 36 at 7 ft. depth;

2,2-Bis (p-chlorophenyl)-

1,1,1 trichloroethane PPDDT ! 3

- Anomalous high concentrations of dieldrin, DDE, and DDT were detected 1.5 miles northwest of RMA;

Hexachlorocyclopentadiene ,CL6CP 3

- A bioaccumulating SHELL product (HCCPD) when combined with bicycloheptadiene (BCHPD) creates Aldrin and Dieldrin – banned in 1974.

Isodrin ISODR coc

- Insecticide produced by Shell at the South Plants from 1954-1973.

Organophosphorus pesticides:

Altrazine ATZ coc ! 3

- Distribution similar to the organochlorine pesticides with offpost concentrations as high as 72.9ppb;[37]

Malathion MLTHN coc 3

- Additional chemical compounds generated as waste in the manufacture of GB included isopropylmethyl phosphonochloridate, isopropylmethyl phosphonic acid {IMPA - although IMPA has been detected in the offpost groundwater, no vegetable uptake study has ever been conducted}, sodium isopropylmethyl phosphonate, isopropanol, and sodium hydroxide- all of which appear to also be within the DIMP plume.
- SHELL Chemical Co. produced dichlor-methylphosphonic dichloride (MC)[53] for the Army during 1952 – 1953[42], used in the manufacture of GB nerve agent at RMA. Acceptable batches of GB contained no more than 3% DIMP and traces of IMPA. Batches that were rejected were dumped into the lime pits south of Basin A[43]. Dichloro is also used in dichlorodiphenyl trichloroethane (DDT) – which, like other organophosphates, also interferes with the conduction of nerve impulses. No mass balance report was ever produced for review by the community.
- A new pesticide law Congress passed unanimously in 1996 – FOOD QUALITY PROTECTION ACT {FQPA} – requires the government to consider the total risk posed to humans when they are exposed to any and all pesticides/organophosphate that have a common mode of toxic action and a similar type of effect. Under the law, a pesticide/organophosphate will not be allowed in the food supply if the total aggregate exposure to the pesticide/organophosphate {exposure from food, water, and home/garden use} is not safe. Safe is defined as a “reasonable certainty” that “no harm” {defined as a one in one million risk, or less, of cancer [the cumulative offpost acceptable cancer risk was 3 in 10,000]} will come to exposed individuals, including infants and children. Finding that exposure to a pesticide “is safe” must include a thorough assessment of all routes of exposure to the pesticide/organophosphate. FQPA prohibits the use of economic arguments as a rationale for exposing infants and children to risks that exceed the health standard of the Act. In the absence of complete and reliable data on pre- and post-natal toxicity and exposure to a pesticide/organophosphate, the EPA Administrator must apply an additional ten-fold margin of safety to food tolerances for the pesticide/organophosphate {FQPA section 408 (b)(2)(C)(ii)(II)}. This law should have been applicable to the folks of Henderson who water their gardens with DIMP/organophosphate contaminated irrigation wells and feed the garden products to their children. However the law was not applied during risk assessment.

(1,2 Dichloroethane) 12DCLE coc ! 3

(Trichloroethylene) TCE coc ! 3

- Evidence of bioaccumulation with a urine measurable breakdown product of trichloroacetic acid.

(Arsenic) As coc ! 3

- Arsenic was detected in 48 percent of the participants in the 1992 *RMA* Pilot exposure study. Of the total, 38.6 percent had trace levels, and 9.2 percent had measurable levels in their urine.
- Proximity to the *RMA* was directly related to the enhanced exposure to Arsenic. Arsenic trioxide was blended with sulfur monochloride at the *RMA*, to produce arsenic trichloride – a part of the 1943 Lewisite production process – where at least 129,000 lbs. of arsenic trioxide was dumped into the M-1 settling ponds. 155,00 tons of chlorine, mustard gas, and arsenic trioxide was produced at the *RMA*. There exists extensive arsenic trioxide soil contamination of the Globeville/Swansea neighborhood, southwest of the *RMA*.
- Hydrolysis does not completely destroy the toxicity of a compound as in the case of chemical agents containing Arsenic. There is a strong association between arsenic ingestion and liver, kidney, lung, and bladder cancer.
- Residence near the *RMA* was positively associated with bladder cancer [35].
- The distribution of arsenic in the offpost groundwater is similar to the distribution of DIMP [34].
- A pattern of bioaccumulation, with increased concentrations at the upper end of the food chain is apparent.
- Arsenic compounds – called arsenic sulfides – remain inert when submerged in the groundwater. Irrigation exposes the poison to oxygen. Once oxidized, arsenic sulfides become water-soluble. Arsenic trichloride rapidly hydrolyzes and would appear in the form of other arsenic compounds.
- Plants most vulnerable are root crops such as carrots, onions and potatoes.
- During mid-1996, the State of Colorado deleted the reporting requirements for elevated urine levels of Arsenic by Colorado laboratories.
- One of three most commonly detected contaminants in stream-bottom sediment in the off-post;
- Arsenic was banned as a pesticide in 1971;
- Arsenic is found as a chemical component in VX (See: VX hereinafter);
- On March 23, 1999, the National Academy of Scientists recommended more stringent controls on arsenic in drinking water admitting uncertainties as to how arsenic exposure triggers cancer and concluded that current EPA regulations "do not sufficiently protect public health". The EPA agreed with the report's findings and will propose a new standard.

(Arsenic) As coc ! 3

(Mercury) Hg coc 3

- Mercury was detected in 24 percent of the participants in the 1992 *RMA* Pilot exposure study. Of the total, 17 percent had trace levels, and 7 percent had measurable levels in their urine.
- Current Congressional reports indicate that the hazards of Mercury are greater than previously believed – a figure one-fifth the amount currently recommended as a maximum by the World Health Organization.
- Concentrations of Mercury are within the Section 26 pathway with large concentrations in Basins A and B.
- The metal tends to concentrate in the tissue of animals in the upper end of the food chain and damages the nervous system.
- One of three most commonly detected contaminants in stream-bottom sediment in the off-post;

(Cadmium) Cd coc ! 3

- T1/2 of 5 to 100 years. Crops most vulnerable are lettuce, corn, wheat and rice.
- During mid-1996, the State of Colorado deleted the reporting requirements for elevated levels of blood cadmium by Colorado laboratories.

Volatile Halogenated Organic Compounds:

- A study by Dr. Sohail Khattak of the Hospital for Sick Children in Toronto (published in the March 1999 Journal of the American Medical Association) which examined human exposure to organic solvents revealed: "Women exposed to organic solvents on the job are 13 times more likely to give birth to a baby with major defects".

(1,2 Dichloroethylene) 12DCE 3

(Carbon Tetrachloride) CCL4 coc !

- Used in the manufacture of GB/Sarin nerve agent.

(Chloroform) CHCL3 coc ! 3

- Also known as Trichloromethane, SHELL usage extended to 1982. Chloroform is highly stable and persistent in the environment.[51] During the 1985-1993 interval, the distribution of chloroform in the Offpost Study area was almost as wide-spread as that of DIMP[36](See Reformulation of G Agents-above).

Methylene Chloride[aka:Methane dichloride] !

(Tetrachloroethylene) TCLEE coc ! 3

1,1,2,2 Tetrachloroethane TCLEA coc 3

1,4 Dichlorobenzene 14DCLB ! 3

(Cadmium) Cd coc ! 3

(Chromium) Cr coc ! 3

(Lead) Pb ! 3

- The Army handled munitions containing lead azide.
- The central nervous system of the human infant is more sensitive to the toxic effects of heavy metals. Functional impairment of the nervous system can occur after exposures that produce no overt neurological toxicity, no gross morphologic changes in the brain, and no overt toxicity to the mother.

Volatile Aromatic Organic Compounds:

Xylenes XYLEN coc 3

- Used in the manufacture of methyl parathion.

(Toluene) coc 3

(Benzene) C6H6 coc ! 3

- Benzothiazole, detected in the groundwater, was found to have the widest distribution across the arsenal of the organo-sulfur compounds. Benzene was used by SHELL to manufacture Aldrin, Dieldrin and Endrin prior to 1957.

(Chlorobenzene) CLC6H5 coc 3

(Ethylbenzene) ETC6H5 coc 3

Volatile Hydrocarbon Compound:

Dicyclopentadiene DCPD coc 3

- Used in insecticide production, purportedly originating from the southeast corner of Basin F.
- Concentrations offpost reached 1490ppb [37].

Organosulphur Compounds:

4- Chlorophenyl methylsulfide CPMS coc

4- Chlorophenyl methylsulfone CPMSO2 coc

- Found in concentrations as high as 60.9 ppb offpost[37];

4- Chlorophenyl methylsulfoxide CPMSO

- Found in concentrations as high as 380.2 ppb offpost[37];

- | | | |
|----------------------|------|---------------------------|
| 1,4 Oxathiane | OXAT | coc |
| 1,4 Dithiane | DITH | coc |
| Dibromochloropropane | DBCP | coc ! 3 (a.k.a.: Nemagon) |
- Pesticide banned in the U.S. in 1977. Concentrations found in the Section 26 pathway at depths greater than 10 feet. Manufactured by Shell at the Arsenal [4];
- | | | |
|-------------------------|------|---------|
| N-Nitroso Dimethylamine | NDMA | coc ! 3 |
|-------------------------|------|---------|
- A decomposition product of unsymmetrical dimethylhydrazine (UDMH) used to produce Aerozine 50 – a hydrazine fuel propellant;
 - ATSDR reports that it is reasonable to expect that exposure to NDMA by eating, drinking, or breathing could cause cancer in humans. NDMA is apart of the Section 26 pathway.

Anions:

- | | | |
|--------------|---|-----|
| (Fluoride) | F | coc |
|--------------|---|-----|
- Chemical compounds used in the manufacture of GB included hydrofluoric acid[53] (and generated the waste of sodium fluoride). The Consumer product safety Commission is considering a standard of 50 milligrams not to exceed 0.5 percent of a product's weight as fluoride.
 - RMA fluoride concentrations are in excess of present limits and within the Section 26 pathway (See: Reformulation of G Agents-above).

- | | | |
|-----------------|----|-----|
| <u>Chloride</u> | Cl | coc |
|-----------------|----|-----|
- Chemical compounds used in the manufacture of GB included carbon tetrachloride (also a chemical waste), methylene chloride and calcium chloride[52]. Pollutant plume found extending 5 to 8 miles north of the RMA; appears to follow the Arsenic/DIMP/Chloroform plume a.k.a.: Section 26 pathway.
 - Sodium chloride was identified in 1955 as being the "principal pollutant" in the off-post groundwater - responsible for extensive private crop damage. A number of " unidentified" materials in smaller concentrations were also mentioned. Chloride, chlorate, sulfate, fluoride and nitrate could have all originated as sodium salts.

Sulfate	SO4	coc
---------	-----	-----

- High concentrations throughout the RMA.
- (Nitrate)
- The *ENVIRONMENTAL WORKING GROUP* has called for cutting the limit from 10ppm to 5ppm to match standards in Germany and South Africa.
 - Complete health data is available on only 7 percent of the more than 3,000 chemicals most widely used in the United States. Of the 75,000 chemicals now in commercial use, researchers estimate 3,750 to 7,500 might reasonably be considered carcinogenic in humans. The number of substances we have identified and regulate as carcinogens is, at present, less than 200.
 - Adverse drug/chemical reactions are the 4th leading cause of death in the U.S. Chemical/drug mixtures are only now being brought to the public awareness.
 - The RMA risk assessment(s) constricted its review based upon a one-chemical-at-a-time vision/additivity approach, parallel to the system of regulating pesticide residue in foods. It ignores exposures to combinations of chemicals that may act in concert. Exposure to one compound may decrease the body's ability to detoxify another, for example.
 - The RMA risk assessment offpost, purportedly considered the pesticide levels already on the feedstock within the plume, but such study has never been made available to the public. I assume that the study merely measured the highest residue concentrations likely under normal agricultural practice however consumption was probably based upon adult eating

habits. Children differ sharply in their ability to activate, detoxify and excrete contaminants as well as eat far fewer types of food in proportionally greater quantities.

- In the private sector, the firms that contaminated a site were never allowed to conduct the endangerment or risk assessment but that this was not true for federal facilities resulting in an inherent conflict of interest. The assessments determine "How clean is clean enough?" and "What is the baseline risk?" By limiting the endangerment assessment to the assumption that the property will be a wildlife preserve, from the onset, closed off all other options without obtaining adequate knowledge to make this judgement. This assumption limits the amount of time any single person would spend on the property and their total exposure to the contamination. Five land use scenarios were developed inclusive of 1) nature preserve, 2) wildlife refuge, 3) recreational park, 4) commercial use, and 5) industrial use. The *Endangerment Assessment* (EA) determined that 121 of the 178 sites investigated are contaminated at levels exceeding preliminary industrial worker exposure criteria. The Army directed that commercial and industrial development was not a viable alternative since the *Federal Facility Agreement* (FFA) stated: "It is the goal of the organizations that ... significant portions of the Arsenal will be available for open space for public benefit...." The Army ecological risk assessor: Ebasco – made decisions as they went along to define risk. They never had EPA guidance on ecological risk assessment. EPA has guidance on human health and residential and industrial exposures. The recipe for human health is not ecological.
- The Little Burlington Canal was not evaluated in the *Endangerment Assessment* / feasibility Study {EA/FS}.
- The "Potentially Responsible Parties" are now engaged in attempting to release additional quantities of the "Chemicals of Concern" {and others} into the surface water of the Sand Creek Lateral, which flows into First Creek and on into the Burlington- O'brian canal or the Little Burlington canal {which provides irrigation water for 10,000 acres of vegetables and other crops in the Burlington area} per the proposed "Hazardous Waste Landfill Wastewater {Lechate} Plan contributing a potential of 81,162.57 ppb COC- combination contamination release into 'zone #4' : previously measured with a 1,787,616.29 ppb level of contamination. In the original Off-Post plan, the surface water was to be cleaned only as a result of dilution. Now are we going to augment the contamination? This proposal would contribute to a pattern of disproportionate pollution in this minority neighborhood – a violation of "environmental justice" and a violation of Title VI.
- Water quality values are predicated on human consumption of both water and aquatic organisms in the water, and ground water (purportedly) does not contain aquatic life, therefore alternative values were used as being "more appropriate" in connection with RMA groundwater. Contaminant levels for cadmium, chromium, copper, lead and zinc were purportedly set for protection of human health but not protective of aquatic life. Environmental based ARAR's should be used for all exposures. Protection of aquatic life is relevant and appropriate.
- Community water storage projects are planned within the DIMP plume pathway along the South Platte River in numerous gravel pits - exposing the non-adjacent community, outside the plume pathway, to possible chronic/acute exposures.
- Commerce City has annexed and zoned #9,000 residential development sites for the land surface above the plume - anticipating .72 children at each site.
- For the Offpost Operable Unit, the Army refused to use the Colorado regulations as a remedial standard – specifically the *Colorado Basic Standards for Groundwater* – as they relate to organic standards.
- The Army failed to consider all reasonable land uses, and therefore exposure pathways, when it defined risks to human health [2].
- Between 1991 and 1994, 200,000 school children visited the RMA;

- Information contained herein was purposefully edited/sensitized from the RMA-Restoration Advisory Board (RAB) Minutes throughout deliberations of 1997. During the RAB Board meeting of September 3, 1998, the Board again refused to approve the edited/sanitized meeting minutes of December 4, 1997 {at which the RAB DIMP standing subcommittee tendered its initial report – thereafter deleted from the minutes by the Army}.

Footnotes: (1) A person consumes 16,000 gallons (Two liters per day for 83 yrs.) of water in a lifetime. More than 70% of the human body consists of water. It takes less than a 1-% deficiency in our body's water to make us thirsty. A 5% deficit causes a slight fever. An 8% shortage causes the glands to stop producing saliva and the skin to turn blue. A person cannot walk with a 10% deficiency, and a 12% deficiency brings death. The *United Nations* estimates that 9,500 children die every day from lack of water or, more frequently, from diseases caused by polluted water [55].

(2) Although 70% of the earth is covered by water, only 3% of the earth's water is fresh. Of that 3%, two-thirds is frozen in glaciers and ice caps, leaving only 1% available for human use. Fresh water is classified as either groundwater, such as underground aquifers (0.7%), or surface water, such as lakes and rivers (0.3%), but less than half of the nonfrozen fresh water in the world is readily accessible [68]. In the United States, approximately half of the drinking water comes from groundwater, with the other half coming from either surface water or mixed surface and groundwater sources [69].

(3) Human beings take 21,600 breaths per day [75].

(4) The former acting RMA Program Manager – Colonel Eugene Bishop – resigned his command on August 21, 1998. The new acting RMA Program Manager is – Colonel Larry Sparks – Chief of the Chemical & Biological Defense Command, Aberdeen, Maryland. **THIS DOCUMENT IS INTENDED TO NOTIFY COL. SPARKS OF THE COMMUNITY'S GREAT CONCERNS WITH RESPECT TO THE OFFPOST GROUNDWATER PLUME.**

Footnotes:

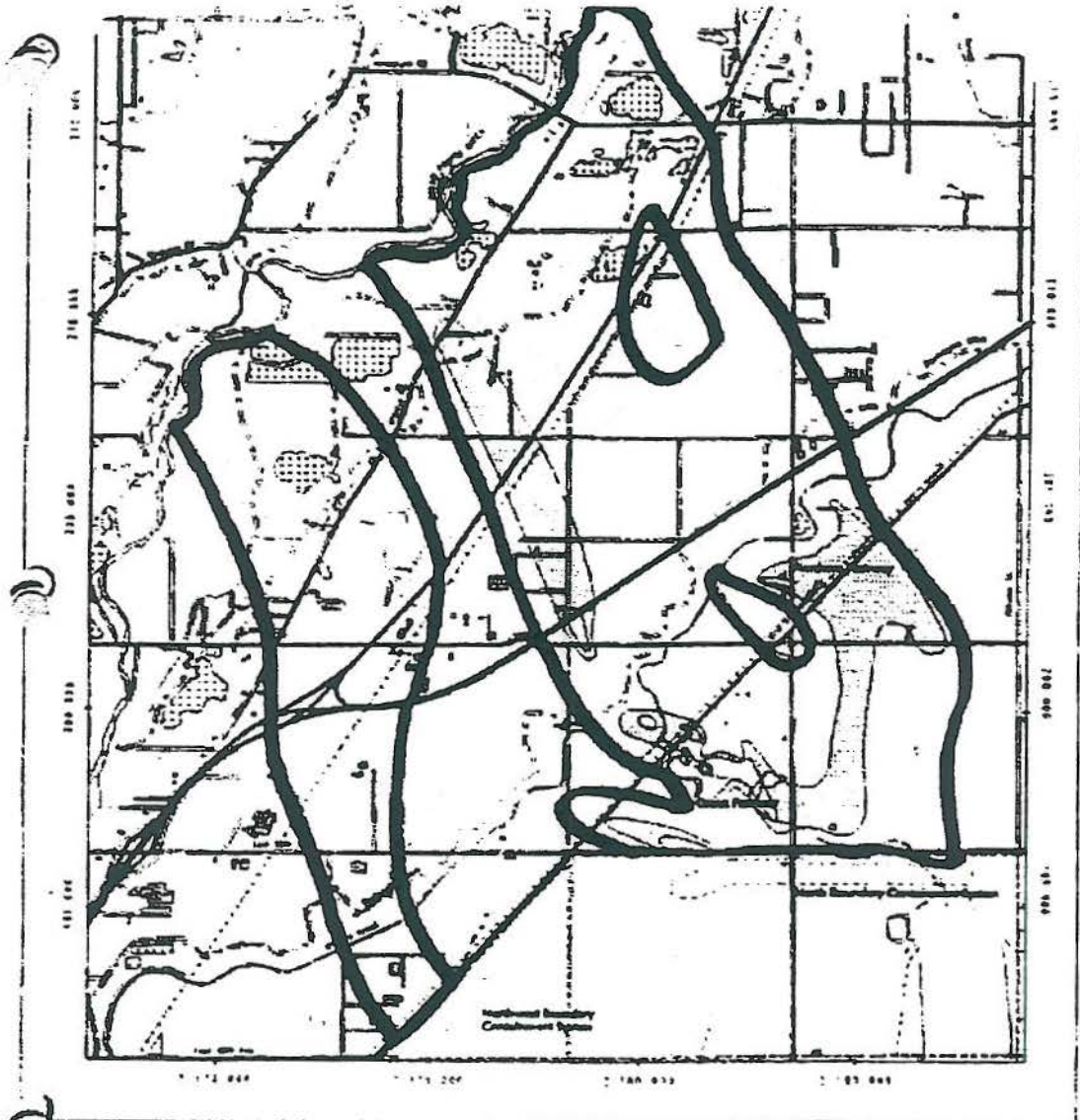
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2. Ibid. 1.; Page 4 – Comment No.6
3. Ibid. 1.; Page 1 – Comment No.2
4. REPRODUCTIVE, NEUROBEHAVIORAL, AND OTHER DISORDERS IN COMMUNITIES SURROUNDING THE ROCKY MOUNTAIN ARSENAL; Page 3.
5. Ibid. 4.; Page 3
6. SELLARDS & GRIGGS for SACWSD "Second Creek Basin" – November 1982: Figure 1
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9. DIMP REMOVAL AT TREATMENT FACILITIES 1993-1997
10. TOXICOLOGICAL PROFILE FOR DIISOPROPYL METHYLPHOSPHONATE: Draft-March 1998 pg.95
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12. CHEMISTRY AND ENVIRONMENTAL FATE OF DIISOPROPYL METHYLPHOSPHONATE (DIMP). Battelle Pacific Northwest Laboratory Edgewood Operations – April 16, 1997, Page1:Footnote 1 and Pg.5
13. Ibid. 12.; Pg. 1
14. Ibid. 12.; Pg. 1
15. Ibid. 12.; Pg. 2
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17. Ibid. 12.; Pg. 5
18. ROCKY MOUNTAIN ARSENAL PROPOSED FINAL CHEMICAL INDEX: August 1988
19. CDPHE WATER QUALITY CONTROL COMMISSION REGULATION NO.41 AMENDED January 11, 1999 Pg.53

20. REPRODUCTIVE, NEUROBEHAVIORAL, AND OTHER DISORDERS IN COMMUNITIES SURROUNDING THE ROCKY MOUNTAIN ARSENAL: Colorado State University Department of environmental Health: August 1996- Page4
21. *LIVING DOWNSTREAM* Pg. 250
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28. RECOGNITION AND MANAGEMENT OF PESTICIDE POISONINGS – *EPA Fourth Edition* – March 1989; Pg.2
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DATA SOURCE: 177
 @ 24,000 AC. Ft. / 7.8 billion gallons

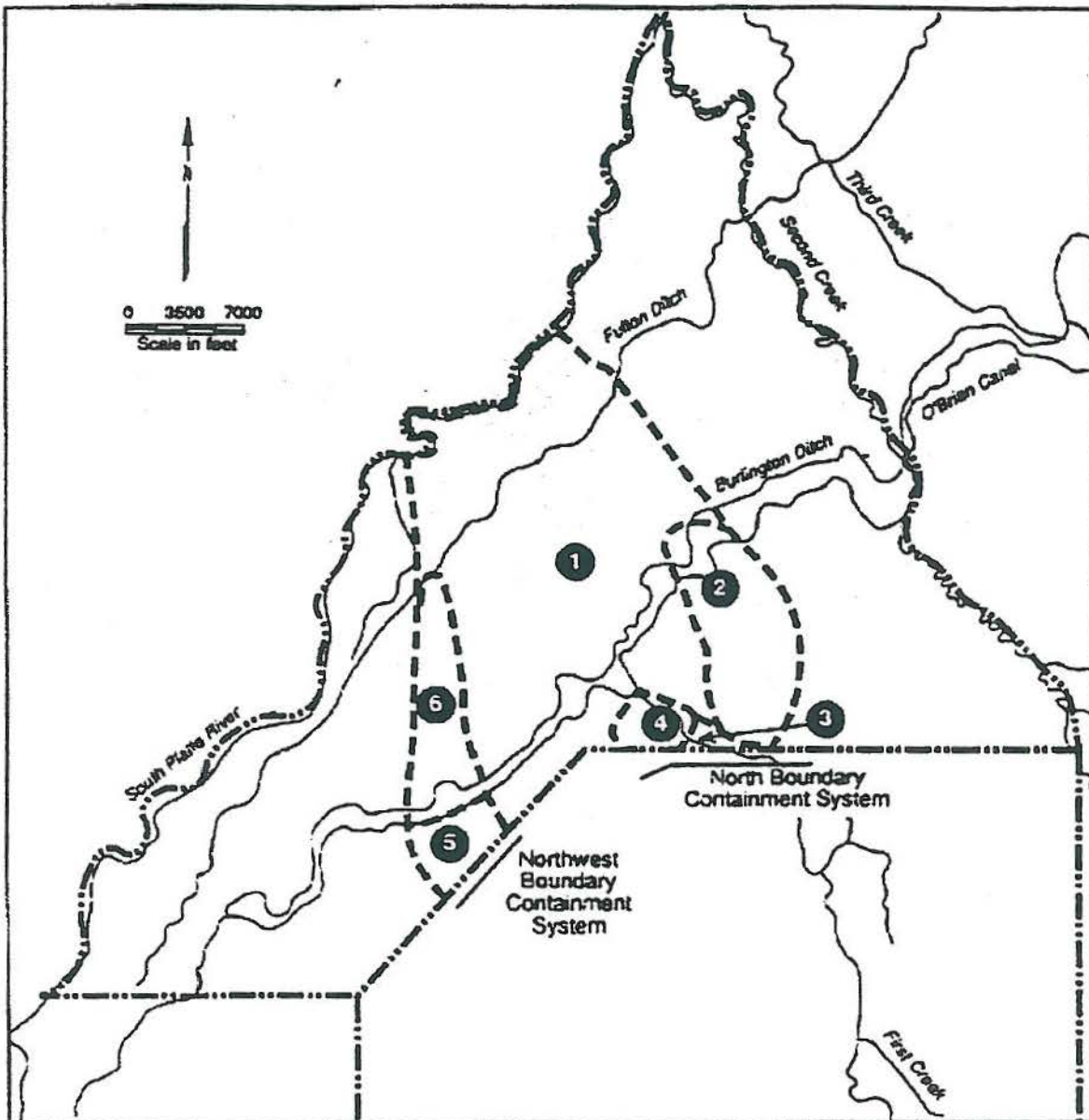


1000
 400 and 17 000
 100 and 17 000
 100 and 17 000
 100 and 17 000

Owners of wells 914A and 923A, which fall just outside of the DMP Plume boundary, will also be offered SACASO water.

0 100 200 300 400 500 600 700 800 900 1000

Prepared by: PDS&C Environmental



Explanation

- Zone 1 Rural residential land use
- Zone 2 Rural residential land use
- Zone 3 Urban residential land use
- Zone 4 Urban residential land use
- Zone 5 Commercial and industrial land use
- Zone 6 Rural residential land use
- Offpost study area boundary

Figure 6.1

Offpost Study Area Exposure Assessment Zones

Table 6.1: Offpost Operable Unit Groundwater Chemicals of Concern

Chemicals of Concern	Exposure Point Concentration $\mu\text{g/l}^a$					
	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6
Aldrin	0.029*	0.045*	0.050*	0.12*	0.039*	0.030*
Arsenic	2.15	1.63	—	2.78*	2.68*	—
Atrazine	2.87	5.31*	12.9*	7.38*	—	4.48*
Benzene	0.61	0.64	0.75	0.92	—	—
Carbon tetrachloride	—	0.76*	—	—	—	—
Chlordane	—	0.18*	0.19*	0.54*	—	—
Chloride	120,000	208,000	457,000*	660,000*	262,000*	191,000
Chlorobenzene	1.02	1.78	1.77	4.51	1.09	1.27
Chloroform	0.66	87.5*	5.01	1.61	12.0*	3.33
CPMSO	—	14.5	10.4	7.68	—	—
CPMSO ₂	—	4.35	5.63	5.09	—	—
Dibromochloropropane (DBCP)	—	0.44*	0.14	0.15	0.10	—
1,2-Dichloroethane	—	0.77*	0.92*	7.32*	—	—
Dicyclopentadiene (DCPD)	—	3.84	163*	66.6*	—	—
DDE	0.029	0.029	0.23*	0.085	—	—
DDT	0.037	0.033	0.11*	0.10	—	—
Dichlorobenzene	—	5.1	—	2.9	—	—
DDMP	63.3*	713*	590*	4950*	7.88	4.67
Dieldrin	0.034*	0.035*	0.21*	0.055*	0.071*	0.039*
Dithiane	—	—	1.97	4.22	—	—
Endrin	0.033	0.037	0.73*	0.058	—	—
Ethylbenzene	—	—	—	0.57	—	—
Fluoride	1830	2210*	3510*	3290*	1810	2230*
Hexachlorocyclopentadiene	0.029	0.033	0.044	0.043	0.035	—
Isodrin	0.028	0.035	0.047	0.057	—	0.040
Malathion	—	0.26	0.36	0.32	—	—
Manganese	—	1580	—	1250	670	—
Oxathiane	—	—	1.32	2.21	—	—
Sulfate	340,000*	636,000*	909,000*	1,118,000*	148,000	213,000
Tetrachloroethene	0.70	10.1*	20.7*	6.08*	0.75	1.67
Toluene	—	—	1.20	1.18	—	—
Trichloroethene	—	0.64	0.51	2.70	—	4.04
Xylene	0.75	—	—	1.11	—	—

—	Not a chemical of concern in this zone
CPMSO	4-chlorophenylmethyl sulfoxide
CPMSO ₂	4-chlorophenylmethyl sulfone
DDE	2,2-bis(p-chlorophenyl)-1,1-dichloroethane
DDT	2,2-bis(p-chlorophenyl)-1,1,1-trichloroethane
DDMP	Diisopropylmethyl phosphonate
$\mu\text{g/l}$	Micrograms per liter

* Exceeds groundwater containment system remediation goal listed in Tables 7.1, 7.2, and 7.3.

^a All exposure point concentrations represent the upper 95 percent confidence limit on the arithmetic mean of measured concentrations in monitoring and private wells.